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ABSTRACT

The third of a three-part computer awareness program for grades K-9, this five-unit guide includes objectives, notes and explanations, and suggested activities for developing basic concepts, skills, and attitudes related to computer technology for grades 7-9. Student activity worksheets are included for each unit. Unit 1 covers computer operation, including use of keys, loading programs from cassette or diskette, and some simple troubleshooting techniques. Unit 2 discusses the physical components of a computer system. The third unit provides background on the development of computational devices and aids, and traces the development of computing aids to emphasize how rapidly computer developments are occurring. Unit 4 teaches computer programming as a vehicle for developing logical, sequential, and creative problem solving skills. The final unit discusses the advantages, limitations, uses, and implications of computer technology, and exposes students to basic applications and corresponding implications of computer use through a series of classroom activities and simulations. (LMM)

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COMPUTER AWARENESS 7-9
DRAFT PILOT GUIDE

Department of Education
June 1985

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

INTRODUCTION

Through Computer Awareness schools can contribute not only to the students' acquisition of basic technological and related occupational information but also to the development of their ability to make informed decisions involving personal attitudes and values. For example, an examination of potential uses and abuses of computers today can support students' skills in evaluating and predicting the impact of computer applications in the future.

For purposes of this document the operational definition of "computer awareness" will be that proposed by the Manitoba Computer Awareness Task Force (K-12) in March 1982. The Task Force considered that computer awareness includes: an understanding of what computers can and cannot do; interaction and communication with computers; using computers to solve problems; and using computers as a tool in the educational setting. The overall goal of computer awareness is to promote an understanding of computer applications in the academic, business and social arenas with their resulting impact upon society.

This document is part of a K-9 Computer Awareness package and is intended to provide the teacher with information needed to establish an awareness program thought appropriate for all students in these grades. The K-9 units have been divided into three packages; namely, K-3, 4-6, and 7-9. Each package provides a scope and sequence of activities which have been divided according to grade level and as to level of difficulty.

Although it is hoped that teachers will adhere to the types of activities felt appropriate for each grade level, it is desirable for teachers to select topics and activities best suited to their students. Introductory activities are intended for students new to computer use whereas those designated as expansion or proficiency are at higher levels of difficulty. The order of activities may easily be altered and the teacher is encouraged to incorporate computer activities/ideas into the remainder of the curriculum or to provide enrichment through computer clubs, etc. Many of the curriculum objectives outlined in this document can be accomplished without using a computer. However, hands-on activities are highly recommended to provide concrete experiences and to increase motivation.

TIME ALLOTMENT

The K-9 Computer Awareness package has been prepared as a series of units which may be taught using either an integrated or discrete approach. These units have been developed for the following teaching times:

K-3	10-15 hours per year
4-6	15-20 hours per year
7-9	20-25 hours per year

ACTIVITIES

Each Computer Awareness package contains a series of objectives and activities. These objectives/activities have been coded as follows:

Example: II-4-2
Level 2
Introduction

"II-4-6" indicates that the activity is part of Unit II, goes with objective 4 and is the sixth activity for that objective.

"Level 2" refers to the second grade level for that particular package. For example, in the 4-6 document Level 2 refers to grade 5 but during the initial implementation of the program, it may be thought of as the second year of exposure to the concept(s) under consideration.

Terms such as "introduction," "expansion," or "proficiency" included with an activity/objective indicate the desired level of student knowledge or mastery thought necessary.

SCOPE AND SEQUENCE	LEVEL 1	LEVEL 2	LEVEL 3
I. GETTING STARTED - 5%			
1. to explain and to show how to switch on a microcomputer	Proficiency		
2. to explain and to show how to care for the system	Proficiency		
3. to explain the "house rules" for the microcomputer	Proficiency		
4. to demonstrate the use of all keys	Introduction	Expansion	Expansion
5. to load a program from a diskette and/or tape	Introduction	Expansion	Proficiency
6. to demonstrate simple trouble shooting techniques	Introduction	Expansion	Expansion
II. WHAT IS A COMPUTER - 15%			
1. to identify the five major parts of the computer	Introduction	Expansion	
2. to describe the operation of the three parts of the central processing unit			Introduction
3. to identify three basic types of computers			Introduction
4. to identify and to compare the many different types of input/output devices	Introduction	Expansion	
5. to identify similarities and differences among computers, calculators, and electronic games	Introduction		
6. to identify different types of storage media			Introduction
7. to recognize that there are many different programming languages		Introduction	Expansion
8. to recognize that a computer gets instructions from a program written in a programming language by a person		Introduction	Expansion

	LEVEL 1	LEVEL 2	LEVEL 3
III. HOW HAVE COMPUTERS DEVELOPED - 10%			
1. to identify and to describe devices which led to the development of the first computer	Introduction	Expansion	Expansion
2. to list and to discuss the characteristics of the four generations of computers		Introduction	Expansion
3. to be increasingly aware of computer development trends		Introduction	Expansion
IV. HOW TO MAKE A COMPUTER WORK FOR YOU - 50%			
1. to identify operating commands	Introduction	Expansion	Proficiency
2. to demonstrate the use of all keys	Introduction	Expansion	Expansion
3. to demonstrate the use of the computer as a calculator	Introduction	Expansion	Expansion
4. to recognize and to use the concepts of the BASIC language	Introduction	Expansion	Expansion
5. to understand the concept of flowcharting	Introduction	Expansion	Expansion
V. COMPUTERS IN OUR LIVES - 20%			
1. to identify a variety of ways that computers are used in the community	Introduction	Expansion	Proficiency
2. to recognize common devices which use computer technology in the home and in the classroom	Proficiency		

	LEVEL 1	LEVEL 2	LEVEL 3
3. to describe how computers are related to leisure time activities	Introduction	Expansion	Proficiency
4. to identify computer related careers			Introduction
5. to discuss possible harmful effects of computer applications			Introduction
6. to identify the advantages and limitations of computers	Introduction	Expansion	Expansion
7. to speculate on how computers might be used in the future	Introduction	Expansion	Expansion

I. GETTING STARTED

The "Getting Started" topic is designed to provide the student with the necessary skills for operation of a computer. These include use of keys, loading programs from cassette or diskette and some simple trouble-shooting techniques. Some emphasis should be placed on learning appropriate care and handling of the computer system. This topic could be used to train students in the use of C.A.I. (Computer Assisted Instruction) programs and should probably preceed Unit IV on How to Make Computers Work For You.

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
	Any machine specific resources are identified using the following abbreviations: Apple - AP, Atari - AT, Radio Shack - TRS, Texas Instrument - TI, Commodore - PET, and Commodore VIC-20 - VIC. If no abbreviation is given, the resource is non-machine specific.	
The student should be able:		
1. to explain and to show how to switch on a microcomputer; (Level 1-Proficiency)	It is recommended that teachers review the manual before setting up equipment. Resource: Department of Education machine manuals (PET, AP, TRS).	
2. to explain and to show how to care for the system; (Level 1-Proficiency)	Instruct students as to proper use and care of tapes, diskettes, and machines.	
	Guard against heat and cold extremes, bending diskettes, water, magnetism, dust, food, static, etc.	I-2-1 I-2-2
3. to explain the "house rules" for the microcomputer; (Level 1-Proficiency)	If the microcomputer is portable then rules will need to be determined in order to use and schedule it efficiently.	I-3-1

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
	If the microcomputer is within a lab then the house rules to the lab will need to be determined so that order is maintained.	
4. to demonstrate the use of all keys; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Expansion)	Instruct students as to the operation of the following keys - alphabet keys, number keys, and special keys such as RETURN/ENTER, STOP/BREAK, graphics, etc. Resource: "PET TOUR" - Winnipeg Pet Users Group Diskette #14 and #24. (Level 1)	I-4-1 I-4-2 I-4-3
5. to load a program from a disk and/or tape; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Proficiency)	Make sure you preview programs to be sure they are suitable, interesting and error free. Teach the "LOAD" and "RUN" commands for your machine.	I-5-1
6. to demonstrate simple trouble shooting techniques. (Level 1-Introduction) (Level 2-Expansion) (Level 3-Expansion)	Check to see that the microcomputer is plugged in. Make sure that the monitor is connected and/or contrast is properly adjusted. Make sure the cassette reorder or disk drive is properly connected. (On the TRS-80 make sure cassette recorder volume stays at one setting: see manual.) Resource: 1. Minnesota Educational Computing Consortium. 101 Activities for Computer Classes. Section A of this manual entitled "Classroom Management" contains useful recommendations. (Levels 1, 2, and 3) 2. Heller, R. and Martin, C. D. Bits 'n Bytes About Computing: A Computer Literacy Primer. Rockville, MD: Computer Science Press, 1982. (Levels 1, 2, and 3)	

II. WHAT IS A COMPUTER?

The purpose of this topic is to provide the student with knowledge about the physical components of a computer system - the computer itself and the peripheral devices which may be used with it (i.e., hardware). In addition, students should be comfortable with the idea that computers operate only through instructions provided by operators and that various computer languages are available for this interaction. Much of this topic involves presentation and use of new vocabulary relevant to these topics.

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
The student should be able:		
1. to identify the five major parts of a computer; (Level 1-Introduction) (Level 2-Expansion)	Teachers could use the corresponding activities and resources to develop an understanding of the five parts of the computer (input, control, memory, arithmetic/logic, and output). Resources: 1. Computer Rage Game - CREATIVE COMPUTING (Level 2 or 3) P.O. Box 789-M Morristown, N.J. 07960 ($8.95 U.S.) 2. Doerr, Christine. Microcomputers and the 3R's. (Levels 1, 2 and 3) 3. "Simulated Computer" Apple diskette (A-Q4), Stekettee Educational Software, 4639 Spruce Street, Philadelphia, PA 19193 (AP) (Level 3)	II-1-1 II-1-2
2. to describe the operation of the three parts of the central processing unit; (Level 3-Introduction)	The central processing unit (CPU) is made up of the control, memory and arithmetic/logic units. Resource: Tatchell, Judy and Bill Bennett. Usborne Guide to Understanding the Micro. (Levels 1, 2, and 3)	II-2-1

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

3. to identify three basic types of computers; (Level 3-Introduction)

Compare capacity, size and price of the three types of computers (micros, minis, and mainframe). Although the definition of these terms is changing, the following size relationships are suggested:

microcomputers - desk top size
minicomputers - phone booth size
mainframe computer - room size

Visit computer stores and computer centres. In Winnipeg one could plan a field trip to Cybershare, Sperry Univac, Burroughs, Red River Community College, University of Manitoba, etc.

4. to identify and to compare the many different types of input/output devices; (Level 1-Introduction) (Level 2-Expansion)

Use the activities and resources to introduce your students to the following input/output devices:

II-4-1
II-4-2
II-4-3

INPUT	OUTPUT
Keyboard	Printer (hard copy)
Card Reader	C.R.T. (Cathode-Ray Tube)
Joysticks/Game Paddles	Speech Synthesizers
Light Pen	Magnetic Disk/Tape
Magnetic Disk/Tape	Plotter
Graphics Tablet	Speaker

Resources: 1. "Scramble" (word scramble program), Vol. 1, No. 3, School Courseware Journal, 1341 Bulldog Lane, Suite C5, Fresno, CA 93710 (available on cassette and diskette for Apple, Pet, TRS-80 and Atari). (Levels 1, 2, and 3)

2. Word find programs:
   - PET - in Cursor magazine #14
     (Cursor Magazine, The Code Works, Box 550, 5778 Hollister, Suite B, Goleta, CA 93017) (Levels 1, 2, and 3)

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

-TRS-80 in CLOAD magazine
(CLOAD Magazine Inc., P. O. Box 1448, Santa Barbara, CA 93102)
-Apple in Minnesota Education Computer Consortium - Elementary Volume 2, Diskette #903 - available through the Department of Education, Computer Services to institutional members.
(Levels 1, 2, and 3)

3. Computer Awareness Filmstrip and Audio Tape Kit (Singer Education Division)
-Society for Visual Education, 1345 Diversy Parkway, Chicago, Illinois 60614 (Levels 1, 2, and 3)

4. Computer Parts Kit
-Educational Computer Shoppe, Route 4, Box 5, Cambridge, Minnesota 55008 (Levels 1, 2, and 3)

5. Tatchell, Judy and Bill Bennett. Usborne Guide to Understanding the Micro. (Levels 1, 2, and 3)

6. Frank, Mark. The Prentice-Hall Concise Book of Computers. (Levels 1, 2, and 3)

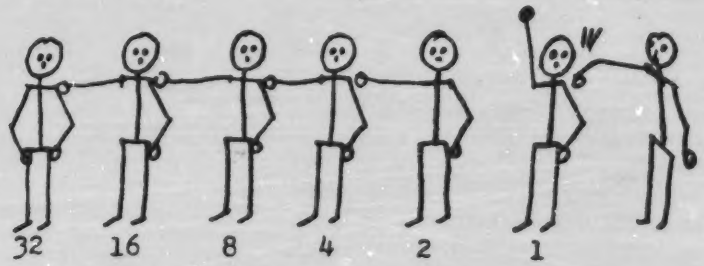
5. to identify similarities and differences among computers, calculators, and electronic games; (Level 1-Introduction)

Teachers could have students bring in hand-held electronic games such as Simon, Big Trak, Merlin, etc. Discuss the similarities (keyboards, chips, input/output) and the differences (memory capacity, uses, flexibility) between these devices and a computer.

Resources: 1. Fast Forward II Videotape "Games"
-Department of Education Library (Level 1)

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
	2. Introducing the Electronic Calculator - Boxfull of Magic/ Electronic Wizard -D.S.A. Educational Media (Level 1)	
6. to identify different types of storage media; (Level 3-Introduction)	Computer storage can be looked at as both internal and external. Internal storage in microcomputers is the RAM (Random Access Memory-changeable) and ROM (Read Only Memory - permanent). These could be described to students by the following analogy - RAM is like a notebook and ROM is like a textbook. External storage would refer to cassettes and diskettes. Resources: 1. Computer Parts Kit (See II-4). (Levels 1, 2, and 3) 2. Weisbecker, J. Computer Coin Games. (Levels 2 and 3) 3. Frank, Mark. The Prentice-Hall Concise Book of Computers. (Levels 1, 2, and 3)	
7. to recognize that there are many different programming languages; (Level 2-Introduction) (Level 3-Expansion)	Some computer languages include: BASIC (Beginner's All Purpose Symbolic Instructional Code) - used in most microcomputers. FORTRAN (FORmula TRANslation) - used for scientific applications COBOL (COmmon Business Oriented Language) - used for business LOGO - a graphics oriented language PILOT - a language designed to make program writing easy for novices Pascal - used by computer scientists Machine Language - based on binary numbers Resources: 1. Computer Rage Game (Levels 2 and 3) 2. The Chip - National Geographic Vol. 162, No. 4 (Level 3) 3. Spencer, D. BASIC Programming. (Levels 1, 2, and 3)	II-7-1

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
8. to recognize that a computer follows instructions from a program written in a programming language by a person; (Level 2-Introduction) (Level 3-Expansion)	Make the point that computers function using binary numbers because the digits 0 and 1 can be represented by the off/on electrical switches. The various high level languages (see II-7) translate English-like statements into a binary code. The activities in this section provide experience in binary code. The activities as well, reinforce the idea that every keyboard character has an equivalent binary code. The following demonstration illustrates the method by which a computer memory unit uses binary arithmetic to store data. Have six students stand in a straight line facing the class with their right arms extended so their hands rest on their neighbours' shoulders. Each student is a 'switch' which will be changed when it receives an impulse. Each student must raise his/her right arm when his/her left shoulder is tapped and lower it again when the shoulder is tapped the next time. The lowered arm will pass the impulse to the next student's shoulder. Another student, acting as the control unit will enter numbers into the memory by tapping the shoulder of student #1 the appropriate number of times.	II-8-1 II-8-2 II-8-3 II-8-4



position after 1 tap

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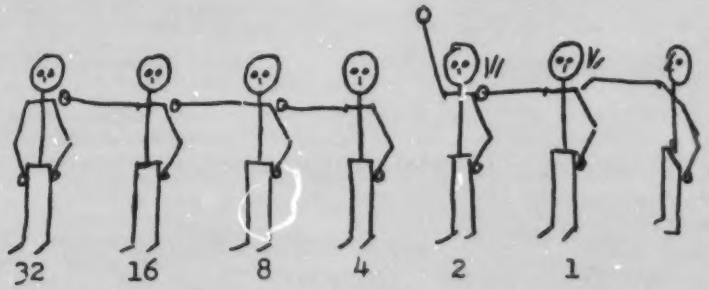
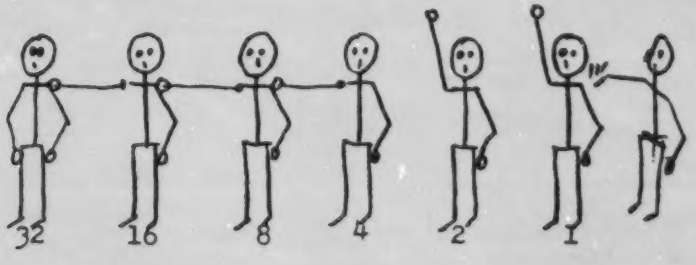
OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES



position after 2 taps



position after 3 taps

Labelling the student positions 1, 2, 4, 8, 16, 32 on the blackboard will emphasize the binary place value.

Resources:
1. Computer Parts Kit (Levels 1, 2, and 3)
2. Weisbecher, J. Computer Coin Games. (Levels 2 and 3)
3. Frank, Mark. The Prentice-Hall Concise Book of Computers. (Levels 1, 2, and 3)

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

4. Minnesota Educational Computing Consortium. 101 Activities for Computer Classes. This excellent resource contains activity sheets in sections C and F entitled "Computer Concepts" and "Computer Number System" respectively which teachers will find extremely useful. (Levels 1, 2, and 3)

5. Heller, R. and Martin, D. C. Bits 'n Bytes About Computing: A Computer Literacy Primer. (Levels 1, 2, and 3)

III. HOW HAVE COMPUTERS DEVELOPED?

This topic should provide students with a background to the development of computational devices and aids. Many people tend to think of computers as rather new. By tracing the development of computing aids from early man to present day, students will become aware of how rapidly computer developments are occurring.

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

The student should be able:

1. to identify and to describe devices which led to the development of the first computer;
   (Level 1-Introduction)
   (Level 2-Expansion)
   (Level 3-Expansion)

The teacher need not feel responsible for formally presenting the history material but should encourage student-centered research activities involving the preparation of charts, murals, timelines, displays, diagrams, biographies, etc. The following topics represent major contributions to the development of computing aids:

- abacus - 2000 B.C.
- finger calculations
- Stonehenge - 1800 B.C.
- Napier's Bones - 1640 A.D.
- first calculating machine, Blaise Pascal - 1647
- first use of punched cards for selection, Joseph Marie Jacquard - 1775
- Difference Engine - mechanically produced logarithmic tables - Charles Babbage - 1812
- Analytical Engine - all components of a modern computer including memory, control, arithmetic/logic unit, and input/output capabilities, Charles Babbage - 1883
- Lady Lovelace - "the first programmer"
- first cash register - James Ritty, 1878
- first adding machine to record entries on paper and running totals, William S. Burroughs, 1880

- Hollerith's sorter - improved on punch card system, used electrical contacts to sense holes and provided a method of sorting, Herman Hollerith, 1880

Research Ideas

1. For the abacus discover:
   i) country of origin,
   ii) where it is used,
   iii) the value of the beads,
   iv) how it is operated.

2. Make an abacus with rods and beads.

3. Use an abacus to perform simple calculations.

4. Produce a set of Napier's Bones and use them to perform simple multiplication or division.

5. Research the life and contributions of:
   i) John Napier
   ii) Blaise Pascal
   iii) Joseph Marie Jacquard
   iv) Charles P. Babbage
   v) James Ritty
   vi) William S. Burroughs
   vii) Herman Hollerith
   viii) James Powers

6. Teachers may wish to have students develop a historical time-line or mural either individually, in groups, or as a class project.

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
	Resources: 1. Tatchell, Judy and Bill Bennett. Usborne Guide to Understanding the Micro. (Levels 1, 2, and 3) 2. Reid-Green, K. "A Short History of the Computer." On Computing. (Levels 2 and 3) 3. Computer Parts Kit. (Levels 1, 2, and 3) 4. Billings, K. and D. Moursund. Are You Computer Literate? (Levels 1, 2, and 3) 5. Logsdon, T. and F. Logsdon. Our Computerized Society with BASIC Programming. (Levels 1, 2, and 3) 6. Brandes, L. G. Yes, Math Can Be Fun! (Levels 1, 2, and 3) 7. Markle, Sandra. The Computer Tutor. (Levels 1, 2, and 3)	
2. to list and to discuss the characteristics of the four generations of computers; (Level 2-Introduction) (Level 3-Expansion)	The development of the modern computer has traditionally been classified into four "generations." Although no strict definitions exist for each, the following guidelines are suggested: - First Generation of Computers (1950-1959) a) based upon vacuum tube design b) gigantic size relative to performance capabilities c) speeds were measured in the millisecond range d) developed enormous amounts of heat; required large air conditioning units e) consumed a great deal of electrical energy f) notoriously unreliable g) programmed in machine language - Second Generation of Computers (1960-1965) a) based upon transistor design b) physically smaller than predecessors c) speeds were measured in the microsecond range d) used a magnetic core for storage	III-2-1 III-2-2

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

- in 1937 Howard Aiken began work on the Automatic Sequence Controlled Calculator. It consisted of 78 adding machines and desk calculators which were controlled by a roll of punched paper. With 800 kilometres of wires connecting its relays and switches this electromechanical computer called MARK I began operation in 1944. It became obsolete fifteen years later.

- ENIAC (Electronic Numerical Integrator and Calculator) was built in 1946 by John Mauchly and Presper Eckert. It was one of the first electronic computers and contained 18 000 vacuum tubes and weighed 30 tonnes. This computer drew 130 000 watts of elec-ricity and it is claimed that all the lights in West Philadelphia used to dim when ENIAC was turned on.

- EDSAC (Electronic Delay Storage Automatic Calculator) was designed and built at Cambridge University in England by Maurice Wilks in 1949. Rather than use the decimal systems of counting as did ENIAC, EDSAC used the binary process which eventually increased computer speeds.

- Two significant ideas which were discovered and included in computers from this time on were the stored program concept and the use of a compiler program. Jon von Neumann introduced a feature which allowed a computer program to be stored inside the computer while the central processor worked on it without operator intervention. Grace Hopper created a compiler program which translated instructions into binary so that the computer could understand them as well as provided the programmer with error messages when instructions were wrong.

- UNIVAC I (UNIVersal Automatic Computer) was the first commercially available computer which was installed at the United States Bureau of Census in 1951.

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OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

e) larger storage capacity which permitted the use of more input and output devices
f) programming was done in symbolic languages

- Third Generation of Computers (1965-1975)
a) based upon solid state technology, or integrated circuit design
b) speeds were measured in the nanosecond range
c) consumed considerably less electrical energy
d) cooler operating
e) main storage technology changed; core replaced by plated wire, thin film, and monolithic storage
f) multi-processing (several programs executing simultaneously became possible
g) on-line system made possible the accessing of the computer from remote locations
h) computer languages improved; more sophisticated for the professional, more simplified for the casual user

NOTE: Captain Grace M. Hopper

Grace M. Hopper, a 76 year old U.S. Navy captain, who worked on the Mark I computer in 1943, distributed symbolic "nanoseconds" in the form of 30 centimetre pieces of wire at the 1983 National Council of Teachers of Mathematics Conference in Sioux Falls, South Dakota. Teachers may wish to pass out to their class a 30 cm piece of wire and explain that the propagation delay, or the time it takes for an electrical current to pass along the length of the wire, is approximately one nanosecond (one-billionth of a second).

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

- Fourth Generation of Computers (1975)
  a) based upon microelectronic technology; the microchip
  b) places into hardware what formerly was in program code in software
  c) has performance improvements of several orders of magnitude
  d) allows main storage to be expanded to millions of characters by utilizing direct access storage as an extension of main storage
  e) allowed for the development of mini and micro computers
  f) has made computers and software available at low cost
  g) development of Silicon Valley

Research Ideas

1. Research the contributions of Howard Aiken - inventor of the Mark I and Mark II.

2. Compare and contrast the Mark I and Mark II.

3. Gather statistics about the size, components, and speed of ENIAC.

4. Research the first generation computers of IBM, Univac, and Burroughs. (Specifically, the IBM 650, 702, 704, 705 and 709; UNIVACI and UNIVACII; and the Burroughs E101).

5. Investigate the invention of the solid state transistor - John Bardeer, William Schockley, Walter Brattain at the Bell Telephone Labs in 1947.

6. Investigate the advantages of solid state transistors over vacuum tube. (Consumed less power, generated less heat, improved reliability, improved speed, physically much smaller.)

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OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
	7. Research to compare the following second generation computers IBM 1400 and 7000 series, Burroughs B5000, UNIVAC III, NCR304, and the Control Data Corporation 1604. 8. Research third generation computers and compare with their predecessors. Third generation computers include IBM 360 series; Burroughs 6500, 7500, 8500; UNIVAC 9000 series; and the NCR Century series. 9. Research other computer languages and their uses. Include Machine language, Symbolic language, FORTRAN, COBOL, PL/1, BASIC, and LOGO.	
3. to become increasingly aware of computer development trends. (Level 2-Introduction) (Level 3-Expansion)	The teacher should explain that computers are growing smaller in size, larger in capacity, cheaper and faster. This can be accomplished using charts, graphs and photographs showing the relative size of different computers from the past and present. If possible show tubes, transistors, diodes, integrated circuits and chips to illustrate the trend to miniaturization. Microscopic examination of damaged chips is interesting for most students. Teachers may wish to play a game which reviews the contributions made by various people to computer development. Each student wears a person's or the "contribution" on his/her back. By asking only one question (which can be answered by "yes" or "no") of each classmate, he/she determines the unknown. For example, a student might ask the following questions as part of the search: 1. "Am I a person?" 2. If "no," then the next question might be, "Was I developed prior to 1600?" 3. If "yes," "Am I 'Stonehenge'?", etc.	III-3-1 III-3-2 III-3-3

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

In order to develop an appreciation of the concept of the size of a million, a billion, etc., students could calculate the number of seconds (or minutes) for a year, 10 years, or a century.

Research Ideas

1. Research the development and improvements of computer print-out devices.

2. Research the contributions of currently outstanding people in the computer field.

3. Research modern computers, concentrating on minis and micros to compare size, cost, memory, availability, functions and software.

Resources:
1. "Now the Chips Are Down" - Videotape, Department of Education Library VR 001.64N69. (Level 3)
2. Fast Forward II - Videotape, "State of the Arts", VR 303.483F28. (Level 3)
3. Billings, K. and D. Moursund. Are You Computer Literate? (Levels 1, 2, and 3)
4. Frank, Mark. The Prentice-Hall Concise Book of Computers. (Levels 1, 2, and 3)
5. Minneosta Educational Computing Consortium. 101 Activities for Computer Classes. Section B entitled "History of Computing" provides a number of excellent activity sheets which reinforce concepts discussed in this unit. (Levels 1, 2, and 3)
6. Heller, R. and Martin, C.D. Bits 'n Bytes About Computing: A Computer Literacy Primer. (Levels 1, 2, and 3)

IV. HOW TO MAKE COMPUTERS WORK FOR YOU

This unit is designed to be more than just a programming unit. The importance of problem solving cannot be overestimated. Computer programming can be seen as a vehicle which allows students to develop logical, sequential, and creative problem-solving skills. Teachers should encourage exploration and experimentation and should emphasize that there are many ways of programming a computer to solve a specified problem. Errors in programs should be viewed not as mistakes but as opportunities to modify and to learn.

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
The student should be able:		
1. to identify operating commands; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Proficiency)	Introduce or review the following basic commands with your students - LOAD, RUN, LIST, NEW, SAVE, VERIFY (see manual for specifics). Make sure that programs used are suitable, interesting, and error free.	I-5-1
2. to demonstrate the use of all keys; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Expansion)	See Unit I, Objective 4.	I-4-1 I-4-2 I-4-3
3. to demonstrate the use of the computer as a calculator; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Expansion)	The computer can be used as a calculator using the PRINT command and the RETURN key; e.g., PRINT 3 + 4 RETURN or ? 3 + 4 RETURN. The computer uses * for multiplication, / for division, and ↑ for exponents. The computer performs arithmetic functions according to the mathematical order of operations: 1. brackets 2. multiplication or division (whichever comes first) 3. addition or subtraction (whichever comes first)	IV-3-1

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
4. to recognize and to use BASIC language; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Expansion)	The following three-level approach is recommended when introducing concepts relating to problem-solving and programing using the BASIC language: - At Level 1, it is suggested that the teacher introduce the following concepts: RUN, PRINT, "?", LIST, NEW, clear the screen, GOTO, and syntax errors. - At Level 2, FOR/NEXT loops, numeric variables, line insertions, deletions, use of semi-colons and commas, string variables and INPUT should be presented. - At level 3, IF/THEN, REM, STEP functions and negative increments in FOR/NEXT loops, and READ/DATA should, together with those taught in Level 1 and 2, provide students with a framework of elementary BASIC concepts. This section should be developed over many classes in which students are gradually exposed to new commands. Students should gain experience in using the commands for writing simple programs. Predicting the outputs of simple programs is a recommended activity as well.	IV-4-5
	Debugging (the correcting of program errors) is a valuable skill to acquire. Teachers should expose students to programs containing typical errors to be corrected. The following format is suggested for teaching programming. This is not intended as a full course in BASIC. Many more examples need to be included to develop the concepts adequately. See the resource list for suggested materials. The teacher should recognize that students' abilities and background in programming will vary widely and the teacher should be prepared to present exercises which have a suitable range of difficulty and required skills. Hands on experience should be emphasized!!	

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

Concept Introduced

Program 1

PRINT

10 PRINT "COMPUTERS ARE GREAT!"

Program 2

Question Mark

10? "COMPUTERS ARE FANTASTIC!"
(What does the ? do?)

Program 3

Multiple Prints

Add the following line to Program 2
20? "THEY NEVER MAKE MISTAKES"
Type LIST and RUN your program

LIST

NEW

Have the students try several programs using the PRINT statement, such as pictures, poems, initials, etc. (Remember the NEW command must be used between programs to clear the memory.)

Clear the Screen

Teach students how to clear the screen using whichever of the following is appropriate:

APPLE	10 HOME
COMMODORE	10 PRINT "[■]"
RADIO SHACK	10 CLS

Consult your manual for other computers. (Students should learn how to clear the screen "in immediate mode" rather than turning off the machine to accomplish this task.)

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OBJECTIVES		NOTES AND EXPLANATION	ACTIVITIES
		Program 4 10 Clear the screen 20 PRINT "SORRY I ONLY JOG!" RUN this program and comment on the apparent intelligence of the computer	
	Concept Introduced GOTO	Program 5 10 Clear the screen 20 Pring "your name" 30 GOTO 20 Be sure to instruct students how to stop the program (PET - RUN/STOP by TRS-80 - BREAK Key, Apple - CONTROL - C, others - see manual) Have the students predict what will happen if line 30 says GOTO 10 and then try it. Teachers should stress the difference between the number "zero" and the letter "O".	
	Syntax Errors	Errors in programming should be dealt with as they occur. Syntax errors can occur for a variety of reasons. Some of these include incorrect spelling of BASIC statements, missing quotes, or missing line numbers.	
	FOR/NEXT	Program 6 10 Clear the screen 20 FOR C = 1 TO 10 30 PRINT C 40 NEXT C	

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OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
Concept Introduced	RUN the above program and discuss its output. How does adding a comma or a semi-colon to the end of line 30 change the output? III-3-1 is a good activity to do at this point.	
	Program 7	
Numeric Variable	10 Clear the screen 20 LET A = 36 30 LET B = 2 40 LET C = A + B Enter and RUN the above program. What do you see on the screen? Discuss why this happens?	
Insertion of Lines	Add the following lines to your program and run it. 25 PRINT A 35 PRINT B 45 PRINT C Now change line 45 to the following: 45 PRINT "THE ANSWER IS "; C RUN the program to see the changes	
Deletion	Students should be instructed how to delete lines. (Type 25 and press RETURN. Tyupe 35 and press RETURN. At this point, the program should be listed to show that lines 25 and 35 have been removed.)	

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

Concept Introduced

Change line 40 in program 6 to use the operation of subtraction (-), multiplication (*), division (/), and/or exponentiation (↑).

Type the following line and RUN.

```
35 PRINT A, B
```

Use of Semi-colon and comma

Type this line again with a semi-colon between A and B. Run the program and note the difference between using a comma or a semi-colon to separate variables.

Program 8

String Variables

```
10 Clear the screen
20 LET A$ = "GARBAGE IN "
30 LET B$ = "GARBAGE OUT "
40 LET C$ = A$ + B$
50 PRINT C$
60 LET D$ = B$ + A$
70 PRINT D$
```

RUN the above program and discuss its output. Note the program assigns two strings, glues (concatenates) them together, and then prints the resulting string.

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OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

Concept Introduced

Program 9

INPUT Statement

```
10 Clear the screen
20 PRINT "WHAT IS YOUR NAME"
30 INPUT N$
40 PRINT "GLAD TO MEET YOU  "; N$
50 PRINT N$; "  HOW OLD ARE YOU"
60 INPUT A
70 PRINT "YOU ARE  "; A; "  YEARS OLD"
```

RUN the above program and discuss the function of the INPUT statement. Please note the difference between string variables (those which end $ sign) and numeric variables.

Add the following lines to program #9 and discuss how the IF . . . THEN statement works.

IF...THEN Statement

```
80 IF A < 13 THEN 110
90 IF A = 13 THEN 130
100 IF A > 13 THEN 150
110 PRINT "YOU ARE NOT A TEENAGER"
120 GOTO 160
130 PRINT "LUCKY 13!"
140 GOTO 160
150 PRINT "YOU SURVIVED CHILDHOOD"
160 END
```

OBJECTIVES		NOTES AND EXPLANATION	ACTIVITIES
	Concept Introduced		
		Program 10	
	Step Function	Have the students type in the following program:	
		10 Clear the screen 20 FOR T = 1 TO 10 30 PRINT T 40 NEXT T 50 END	
		Modify the above program as follows: 20 FOR T = 1 TO 100 STEP 2. RUN and discuss the output	
		Program 11	
	Negative Increment	10 Clear the screen 20 FOR C = 10 TO 1 STEP-1 30 PRINT C 40 NEXT C 50 PRINT "BLASTOFF"	
		Discuss the negative increment.	
	REM Statement	Teachers should encourage students to use REM statements at the beginning of all programs to identify the owner. Such REMarks are useful as part of documentation. For example:	
		10 REM SUSIE SMITH 20 REM THIS CALCULATES THE AVERAGE	

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OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

Concept Introduced

Also, students should be taught how to insert blank lines in screen output (by inserting PRINT statements).

Teachers should discuss with the class how the READ and DATA concepts are used in BASIC by using several simple examples such as the following program.

Program 12

```
10 Clear the screen
20 READ A
30 PRINT A
100 DATA 7, 8, 15, 9, 11
RUN and discuss.

Add the following lines:

40 READ B
50 PRINT B
   RUN and discuss

Add the following lines:

60 READ C, D
70 PRINT C, D
   RUN and discuss.
```

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OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
Concept Introduced	Add the following lines 80 READ E, F 90 PRINT E, F RUN and discuss. Modify the program to overcome the error. Type NEW to clear the memory and enter the following program. Program 13 10 Clear the screen 20 READ N$, A 30 PRINT N$, A 40 DATA "JACK HAMMER"' 14 RUN and discuss. Modify line 40 in program 13 to the following: 40 DATA "JACK HAMMER", "FOURTEEN" RUN and discuss Modify the READ statement to overcome the error.	

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

Concept Introduced

Type NEW to clear the memory and enter the following program.

Program 14

```
10 Clear the screen
20 FOR C = 1 TO 12
30 READ M$, D
40 PRINT M$; "  HAS  ; D;" 0 DAYS."
50 NEXT C
60 DATA "JANUARY", 31, "FEBRUARY", 28, "MARCH", 31,
   "APRIL", 30
70 DATA "MAY", 31, "JUNE", 30, "JULY", 31, "AUGUST", 31
80 DATA "SEPTEMBER", 30, "OCTOBER", 31, "NOVEMBER", 30,
   "DECEMBER", 31
```

RUN and discuss.

Experiment by changing the final number, 12, in line 20 to vary the number of loops.

Teachers may wish to assign a final project such as "write a drill program to quiz the students on the provinces and capitals of Canada." The following is an example of a finished product.

Program 15

READ/DATA Statement

```
10 REM GUESS THE CAPITAL
20 Clear the Screen
30 FOR I = 1 TO 10
40 READ P$, C$
50 PRINT "WHAT IS THE CAPITAL"
```

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
Concept Introduced		

```
 60 PRINT "OF   "; P$
 70 INPUT G$
 80 IF G$ = C$ THEN 120
 90 PRINT "SORRY . . . YOU ARE INCORRECT."
100 PRINT "THE ANSWER IS  "; C$
110 GOTO 130
120 PRINT "CONGRATULATIONS!"
130 PRINT
140 NEXT I
150 DATA "BRITISH COLUMBIA", "VICTORIA"
160 DATA "ALBERTA", "EDMONTON"
170 DATA "SASKATCHEWAN", "REGINA"
180 DATA "MANITOBA", "WINNIPEG"
190 DATA "ONTARIO", "TORONTO"
200 DATA "QUEBEC", "QUEBEC CITY"
210 DATA "NEW BRUNSWICK", SAINT JOHN"
220 DATA "P.E.I.",  CHARLOTTETOWN"
230 DATA "NOVA SCOTIA", "HALIFAX"
240 DATA "NEWFOUNDLAND", "ST. JOHN'S"
250 END
```

For enrichment students enjoy working with graphics, animation, sound and colour. Consult your micro-computer manual for specific instructions and other extensions.

IV-4-1
IV-4-2
IV-4-3
IV-4-4
IV-4-5

OBJECTIVES	NOTES AND EXPLAHATION	ACTIVITIES

Resources:

1. Ahl, D.H. BASIC Computer Games. (Levels 1, 2, and 3).
2. Ahl, D.H. More Basic Computer Games. (Leavels 1, 2, and 3).
3. Boren, S. A PET in the Classroom (Teacher's Manual). (Levels 1, 2, and 3)
4. Zamora, R, R. Albrecht, and W. Scarvie. PET BASIC-Training Your Computer. (Levels 1, 2, and 3)
5. Jones, A.I. I Speak BASIC to my TRS-80 (also for PET, VIC and Apple). (Levels 1, 2, and 3)
6. Greenwood-Larsen, S. Computers for Kids (Apple, TRS-80 and Atari editions available). (Levels 1 and 2)
7. Bonello, T. The Road to Success Using the PET. (Levels 1, 2 and 3)
8. Carlson, E.H. Kids and the Apple (Atari and Vic editions available). (Levels 1, 2, and 3)
9. Richardson, K. 1 Computer-30 Kids. (Levels 1, 2, and 3)
10. Gerling, M.O. Creative Programming (TRS-80, TI, VIC, Apple and PET editions available). (Levels 1, 2, and 3)
11. Rugg, T. and P. Feldman. TRS-80 Color Programs. (Levels 1, 2, and 3)
12. Rogowski, S. J. Problems for Computer Solution. (Level 3)
13. Alexander, C. Looking Good with Your PET. (Levels 1, 2, and 3)
14. Alexander, C. Feed Me, I'm Your PET Computer. (Levels 1, 2, and 3)
15. Albrecht, B. and G. Firedrake. My TRS-80 Likes Me. (Levels 1, 2, and 3)
16. Lipscomb, S.D. and M.A. Zuanich. BASIC Fun. (This book is highly recommended as it is designed to work on a number of computers and it is quite inexpensive.) (Levels 1, 2, and 3)

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
	17. Heller, R. and Martin, D.C. Bits 'n Bytes About Computing: A Computer Literacy Primer. (Levels 1, 2, and 3) 18. Minnesota Educational Computing Consortium. 101 Activities For Computer Classes. Section G entitled "Computer Programming" provides a great number of activity sheets that students can work on to reinforce concepts discussed in this section. (Levels 1, 2, and 3)	
5. to understand the concept of flowcharting. (Level 1-Introduction) (Level 2-Expansion) (Level 3-Expansion)	Flowcharting should be viewed as an aid to visualizing correct step by step sequencing, branching, and looping. While there are accepted formats for flowcharting, use of these is not necessary. It is suggested that flowcharting activities begin with non-numerical examples such as making a peanut butter sandwich, washing a car, taking a bath, etc., and progress to flowcharting simple BASIC programs. The following types of exercises could be employed: 1. Given a flowchart write the corresponding program 2. Given a program write the corresponding flowchart 3. Given a flowchart identify the output Resources: 1. Template for flowcharting--available from Red River Community College, University of Manitoba Bookstore, etc. (Levels 1, 2, and 3) 2. "Information Processing in Society" - audio visual kit, 1972, Department of Education Library. (#K651.8N37) (Level 3) 3. Kindrachuk, K.M., et al. Computer Literacy. (Levels 1, 2, and 3) 4. Greenwood-Larsen, S. Computers for Kids (Apple, TRS-80 and Atari editions available). (Levels 1, 2 and 3)	IV-5-1 IV-5-2 IV-5-3

V. COMPUTERS IN OUR LIVES.

The technological explosion of the last few years has made it possible for individuals as well as corporations to purchase computer systems capable of changing daily activities in the home, at school, and in the work place. Students should become increasingly aware of the advantages, limitations, uses, and implications of this computer technology. This unit is designed to expose students to basic applications and corresponding implications of computer use through a series of classroom activities and simulations.

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
The student should be able:		
1. to identify a variety of ways that computers are used in the community; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Proficiency)	Some areas where computers may be used in the community include: banks, police stations, supermarkets, medicine, newspapers, airports, weather bureaus, railways, agricultural offices, utilities. Plan field trips and/or write representatives from the community who are working with computers to speak to the class. Research Ideas 1. Make a list of the ways in which the computer is used by the police. 2. Identify some of the fears that you, a law abiding citizen, have about police use of computers. 3. Predict other uses the police might make of computers in the future.	See II-4-3
2. to recognize common devices which use computer technology in the home and in the classroom; (Level 1-Proficiency)	The following are examples of common devices using computer technology: Intellivision, Atari VCS, Little Professor, Simon, Speak and Spell, Big Trak, microwave oven, video tape recorder, calculators, organs, automobiles, and sewing machines with "program" disks.	See II-4-3

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
3. to describe how computers are related to leisure time activities; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Proficiency)	Research may be done on the use of computer technology of the following areas: music, art, lighting, writing (word processing), film, choreography, animation, etc. Resources: 1. Fast Forward - video tape, "Music" VR 303.483 F37 (Levels 1, 2, and 3) 2. Fast Forward - video tape, "Art Using Science" VR 303.483 F37 (Levels 2 and 3) 3. Van Tassel, D. Computer, Computer, Computers in Fiction and in Verse. (Levels 1, 2, and 3) 4. Van Tassel, D. The Compleat Computer. (Levels 1, 2, and 3)	
4. to identify computer related careers; (Level 3-Introduction)	Research applications of computers in banks, restaurants, hospitals, travel agencies, programming, office work, etc. Examine CHOICES (Computer Career Search). Look at newspaper advertisements for computer related job positions and identify type, number, salary, etc. Interview someone who works with computers. Research information on a career in computers. (A list of suggestions is given below.) Discuss the career in terms of the following: 1. Educational background required 2. Job description 3. Salary range 4. Job openings 5. Opportunities for advancement	

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

Possible computer careers include:

1. Programmer
2. Computer Operator
3. Computer Educator
4. Computer Technician
5. Data Entry Clerk
6. Systems Analyst

Resource: Jobs in Data Processing (Kit), Coronet Instructional Media, 1974 (KU01.6 J63) - Department of Education Library. (Level 3)

5. to discuss possible harmful effects of computer applications; (Level 3-Introduction)

Areas which might be investigated include: invasion of privacy, computer crime, possible job displacement, and depersonalization (being treated as a number).

Teachers may wish to have students act out the play "The Day the Computer Got Waldon Ashenfelter" regarding the privacy issue and the pros and cons of a National Data Bank. This play can be found in the three resources listed below.

Resources:
1. Adams, J. Mack and Douglas H. Haden. Computers:Appreciation, Applications, Implications--An Introduction.
2. Metcalfe, Brian. "Computer Awareness: Recipes and Resources for the High School Classroom".
3. Van Tassel, D. The Compleat Computer.

Teachers should ask students to "brainstorm" and list the names of data banks that currently exist. Ask students to make a list of information that is probably stored in certain files. Determine the advantages that a National Data Bank could provide. What might be some of the disadvantages to such a system?

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES
	Teachers should encourage students to discuss the implications of a "cashless society" with respect to the following points: - What is meant by a cashless society? - Describe how life in a cashless society will become easier? - Describe how the computer will remove the need for us to carry cash? - What are some disadvantages to having an electronic money system? - Are you personally in favour of a cashless society? Resources: 1. Whiteside, Thomas. Computer Capers - Tales of Electronic Thievery, Embezzlement and Fraud. (Level 3) 2. Van Tassel, Dennie L. The Compleat Computer. (Levels 1, 2, and 3) 3. Adams, J. Mack and D. H. Haden. Computers:Appreciation, Applications, Implications - An Introduction. (Levels 1, 2, and 3) 4. Parker, D. B. Crime by Computer. (Level 3).	
6. to identify the advantages and limitations of computers; (Level 1-Introduction) (Level 2-Expansion) (Level 3-Expansion)	Computers cannot think, judge, feel emotions, etc. But computers are fast, accurate, do repetitive tasks, work in dangerous situations, etc. If transparencies are made from the activity sheets V-6-1 and V-6-2, students should be encouraged to suggest tasks which can be done best by human and by computer. Students should determine and discuss whether computers or humans can best accomplish the following tasks: see, sort, hear, taste, suffer, love, observe, write, enjoy, compare, predict, forget, smell, create, recite, invent, judge, rearrange, classify, compose, remember, identify, feel, imagine, guess, match, estimate, compute, recognize, alphabetize, describe, calculate, choose, etc. Encourage students to make a list of areas in society that use computers. Teams of two students should research a particular area and present their findings to the rest of the class. If the teacher finds that	V-6-1 V-6-2

no team of students wants to be the first to present their information, use the computer program which is provided as an activity to select students in a random fashion. If students are given a chance to see the program operate first, they are much more likely to accept the computer selection order. Perhaps the teacher might wish to enter the seven colours of the rainbow in order (red, orange, yellow, green, blue, indigo and violet) and run the program several times to show that the selection order changes each time. The teacher then should enter the respective students names and run the program. It is doubtful that there will be any complaints when the following program is run and the students are randomly selected by computer.

```
READY.

 10 REM* PICK-A-PERSON PROGRAM
 12 REM* FOR MICROCOMPUTERS
 14 REM* LINES 40,250 & 1060 CLEAR
 16 REM* SCREEN - SEE YOUR OWN
 18 REM* MANUAL FOR SPECIFIC
 19 REM* MICRO.
 30 DIM N$(50), R(50)
 40 PRINT"■"
 50 PRINT"  HOW MANY STUDENTS"
 55 PRINT"OR TEAMS DO YOU WANT"
 60 PRINT"TO RANDOMIZE?"
 70 INPUT N
 72 REM* SELECT RANDOM 'SEED'
 74 REM* BASED ON TIME 'TI' -
 76 REM* DIFFERS ON OTHER MICROS
 78 LET X=RND(-TI)
 80 FOR I=1 TO N
 90 PRINT"ENTER STUDENT/TEAM"
 95 INPUT N$(I)
 100 R(I)=RND(1)
 110 NEXT I
```

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

```
120 REM* SORT RANDOM VALUES
130 REM* AND MIXUP NAMES
140 FOR I=1 TO N-1
150 IF R(I+1) >= R(I) THEN 230
160 REM* SWITCH RANDOM VALUES AND NAMES
170 LET T=R(I)
180 LET R(I)=R(I+1)
190 LET R(I+1)=T
200 LET T$=N$(I)
210 LET N$(I)=N$(I+1)
220 LET N$(I+1)=T$
230 NEXT I
240 REM* DISPLAY RANDOM SELECTION
250 PRINT"□"
260 PRINT"THE COMPUTER SELECTED"
265 PRINT"THE STUDENTS/TEAMS IN"
270 PRINT"FOLLOWING ORDER:"
280 FOR I=1 TO N
290 IF INT(I/11)*11<>I THEN 310
300 GOSUB 1000
310 PRINT"#";I;"IS ";N$(I)
320 NEXT I
330 PRINT
340 PRINT"BYE FOR NOW."
350 END
1000 REM* ROUTINE ALLOWS USER CONTROL
1010 REM* OF SCREEN DISPLAY SPEED
1020 PRINT
1030 PRINT
1040 PRINT"PRESS 'C' TO CONTINUE"
1050 GET R$:IF R$ <> "C" THEN 1050
1060 PRINT"□"
1070 RETURN
```

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

Students may wish to research and discuss robotics and bionics.

Resources:
1. Gatland, K. and David Jefferis. The World of the Future: Robots. (Levels 1, 2, and 3)
2. Bionics Man or Machine - Film - Department of Education Film Library. (Levels 1, 2, and 3)
3. The Robots are Coming - Film - Department of Education Film Library. (Level 3)
4. Fast Forward - Humanized Technology - video tape, Department of Education Film Library VR 303.483 F37. (Levels 2 and 3)
5. Fast Forward 1 - Biomedics - video tape, Department of Education Film Library VR 303.483 F37. (Level 3)
6. Frank, Mark. The Prentice-Hall Concise Book of Computers. (Levels 1, 2, and 3)

7. to speculate on how computers might be used in the future.
(Level 1-Introduction)
(Level 2-Expansion)
(Level 3-Expansion)

Possible activities include:

1. Students could be encouraged to draw cartoons about computers and/or robots depicting:

   - how they feel about computers.
   - how computers may affect their lives.
   - possible computer uses in the future.

2. Have students write alternate captions for computer related cartoons.

3. Assign a futuristic short story "The Computer and Me in 2003."

4. Students could be encouraged to write limericks or poems which suggest how a computer might be used in the future. The following, with apologies to Ogden Nash, might be used as a sample.

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

There once was a secretary--none cuter,
Who was replaced by a microcomputer,
'Twas the wife of the boss,
Who put this deal across,
As you see, the computer was neuter.

Have the students complete the questionnaire "Computers and Society" in class. In a follow-up class, students should take the questionnaire home for an adult to complete. Teachers may wish to compare and contrast the results with their classes. V-7-1

4. Read books and stories about robots. (Public libraries have books by Isaac Asimov.) Select from the following project topics:

   - Build or draw a robot. Compare android and mechanical features.
   - Describe some of the things that robots do in industry. Which of these jobs are boring or dangerous?
   - Predict what jobs robots will do in the home in the future.
   - What characteristics do robots have in films such as Star Wars, 2001, and E.T.?

Resources:
1. Gatland, Kenneth and David Jdfferis. The World of the Future: Robots. (Levels 1, 2, and 3)
2. Ahl, D. The Colossal Computer Cartoon Book. (Levels 1, 2, and 3)
3. Spencer, D. Some People Just Won't Believe a Computer. (Levels 1, 2, and 3)
4. ----------. The Usborne Book of the Future. (Levels 1, 2, and 3)
5. Usborne, A. Running Wild-The Next Industrial Revolution. (Levels 2 and 3)

OBJECTIVES	NOTES AND EXPLANATION	ACTIVITIES

6. Evans, C. The Micro Millennium. (Level 3)
7. Frank, Mark. The Prentice-Hall Concise Book of Computers. (Levels 1, 2, and 3)
8. Minnesota Educational Computing Consortium. 101 Activities for Computer Classes. The sections entitled "Computers in Society," "The Computer Industry," and "Just for Fun" will provide teachers with numerous one-page activity "handouts" which students will enjoy completing. This resource is indeed an excellent investment as it contains activities which complement the objectives of this package and foster computer awareness. (Levels 1, 2, and 3)
9. Heller, R. and Martin, D.C. Bits 'n Bytes About Computing: A Computer Literacy Primer. (Levels 1, 2, and 3)

7-9 COMPUTER AWARENESS RESOURCES

Adams, J. Mack and D. H. Haden. Computers: Appreciation, Applications, Implications - An Introduction. New York: John Wiley & Sons, Inc., 1973.

Ahl, D. H. BASIC Computer Games. Morristown, NJ: Creative Computing Press, 1978.

Ahl, D. H. The Colossal Computer Cartoon Book. Morristown, NJ: Creative Computing Press, 1977.

Ahl, D. H. Computers in Mathematics: A Sourcebook of Ideas. Morristown, NJ: Creative Computing Press, 1979.

Ahl, D. H. More BASIC Computer Games. Morristown, NJ: Creative Computing Press, 1979.

Albrecht, B. and G. Firedrake. My TRS-80 Likes Me. Fort Worth: Radio Shack, 1980.

Alexander, C. Feed Me, I'm Your PET Computer. Manhasset, NY: Cow Bay Computing, 1979.

Alexander, C. Feed Me, I'm Your PET Computer Teacher's Guide. Manhasset, NY: Cow Bay Computing, 1979.

Alexander, C. Looking Good With Your PET. Manhasset, NY: Cow Bay Computing, 1979.

Billings, K. and D. Moursund. Are You Computer Literate? Beaverton, OR: Dilithium Press, 1979.

Bonello, T. The Road to Success Using the PET. Toronto: Metropolitan Separate School Board Curriculum Special Services Department, 1982.

Boraiko, Allen A. "The Chip." National Geographic, 162, No. 4, 1982, pp. 421-457.

Boundey, William, Ed. Introducing the Electronic Calculator--Boxful of Magic/Electronic Wizard. Santa Monica: D.S.A. Educational Media, 1973.

Boren, S. A PET in the Classroom (Teacher's Manual). Eugene, OR: Alan R. Boren, 1981.

Brandes, L. G. Yes, Math Can Be Fun! Portland, ME: J. Weston Walsh, 1960.

Carlson, E. H. Kids and the Apple. Reston, VA: Reston Publishing Company, 1982.

Doerr, Christine. Microcomputers and the 3R's. Rochelle Park, NJ: Hayden Book Company, 1979.

Dojka, D. and P. H. Dorn. "Magic Moments in Software." Datamation.

Evans, C. The Micro Millennium. New York: Pocket Books, 1979.

Frank, Mark. The Prentice-Hall Concise Book of Computers. Scarborough, ON: Prentice-Hall Canada, Inc., 1982.

Gatland, Kenneth and David Jefferis. The World of the Future: Robots. Burlington, ON: Hayes Publishing Ltd., 1979.

Greenwood-Larsen, S. Computing for Kids. Apple ed. Morristown, NJ: Creative Computing, 1981.

Greenwood-Larsen, S. Computing for Kids. PET ed. Morristown, NJ: Creative Computing, 1981.

Greenwood-Larsen, S. Computing for Kids. TRS-80 ed. Morristown, NJ: Creative Computing, 1981.

Immel, R. A. "Silicon Valley - The Wildwest of Computer Technology." Popular Computing. March (1982), pp. 102-108.

Jones, Aubrey B. I Speak BASIC to My Apple. Rochelle Park, NJ: Hayden Press, 1982.

Jones, Aubrey B. I Speak BASIC to My Pet. Rochelle Park, NJ: Hayden Press, 1982.

Jones, Aubrey B. I Speak BASIC to My TRS-80. Rochelle Park, NJ: Hayden Press, 1982.

Kindrachuk, R. M. et al. Computer Literacy. Saskatoon, SK: Board of Education, 1980.

Lipscomb, S. and M. Zuanich. BASIC Fun - Computer Games,Puzzles,and Problems Children Can Write. New York: Avon Camelot, 1982.

Logsdon, T. and F. Logsdon. Our Computerized Society with BASIC Programming. Fullerton, CA: Anaheim Publishing Co., 1979.

Markle, Sandra. The Computer Tutor. Santa Barbara: The Learning WWorks, Inc., 1981.

Manitoba Department of Education. Apple II User's Guide. Winnipeg: The Department, 1983.

Manitoba Department of Education: Commodore PET User's Guide. Winnipeg: The Department, 1983.

Manitoba Department of Education: TRS-80 Model III User's Guide. Winnipeg: The Department, 1983.

Metcalfe, Brian. "Computer Awareness: Recipes and Resources for the High School Classroom." Unpublished Specialist Dissertation, Mankato State University, 1979.

Minnesota Educational Computing Consortium. 101 Activities for Computer Classes.

Osborne, A. Running Wild - The Next Industrial Revolution. Berkeley, CA: McGraw-Hill, 1979.

Parker, D. B. Crime by Computer. New York: Charles Scribner's Sons, 1976.

Reichardt, J. Robots, Fact, Fiction, and Prediction. Middlesex, England: Penguin Books, 1978.

Reid-Green, K. "A Short History of the Computer." On Computing, 1981, pp. 54-58.

Richardson, K. 1 Computer - 30 Kids. Indianapolis, IN: MEKA Publishing Company, 1981.

Rogowski, S. J. Problems for Computer Solution. Morristown, NJ: Creative Computing Press, 1980.

Rugg, T. and P. Feldman. TRS-80 Color Programs. Beaverton, OR: Dilithium Press, 1982.

Smith, B. R. Introduction to Computer Programming. Burlington, ON: Hayes Publishing Ltd., 1982.

Spencer, D. BASIC Programming. Ormond Beach, FL: Camelot Publishing, 1983.

Spencer, D. Computer Poster Book. Ormond, FL: Camelot Publishing, 1982.

Spencer, D. Famous People of Computing. Ormond Beach, FL: Camelot Publishing, 1982.

Spencer, D. Some People Just Won't Believe a Computer. Ormond Beach, FL: Camelot Publishing, 1978.

Tatchell, Judy and Bill Bennett. Usborne Guide to Understanding the Micro. Burlington, ON: Hayes Publishing Ltd., 1982.

Van Tassel, Dennie L., Ed. The Compleat Computer. Chicago, IL: Science Research Associates, Inc., 1976.

Van Tassel, Dennie L. Computer, Computer, Computers in Fiction and in Verse. New York: Thomas Nelson, Inc., 1977.

Weisbecker, J. Computer Coin Games. Morristown, NJ: Creative Computing, 1979.

Whiteside, Thomas. Computer Capers - Tales of Electronic Thievery, Embezzlement and Fraud. Scarborough, ON: The New American Library of Canada, Ltd., 1979.

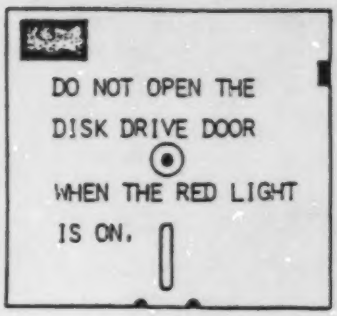
Zamora, R., R. Albrecht, and W. Scarvie. PET BASIC - Training Your Computer. Reston, VA: Reston Publishing Company, 1981.

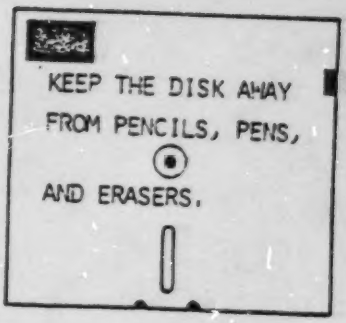
( ). "BASIC Bugs." CLOAD. ( ), 1981, ( ).

Carlson, E. H. Kids and the VIC. Reston, VA: Reston Publishing Company, 1982.

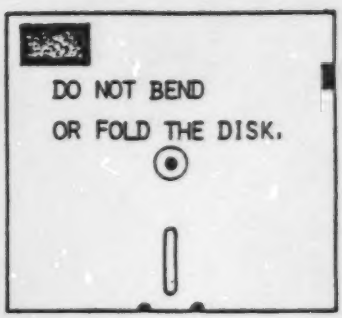
Heller, R. S. and Martin R.C. Bits 'n Bytes About Computing: A Computer Literacy Primer. Rockville, MD: Computer Science Press, 1982.

Jones, Aubrey B. I Speak BASIC to my VIC. Rochelle Park, NJ: Hayden Press, 1983.





"USE AND CARE OF DISKS"



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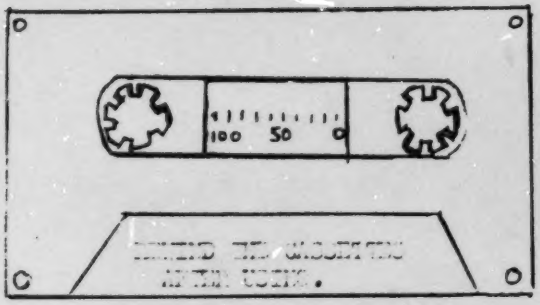

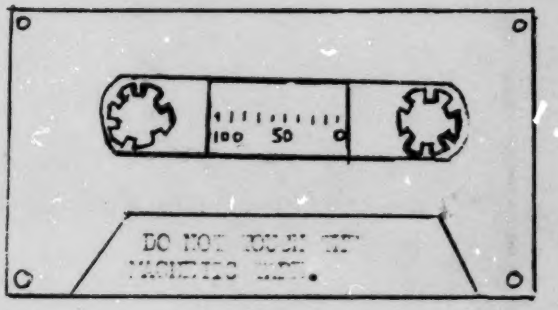

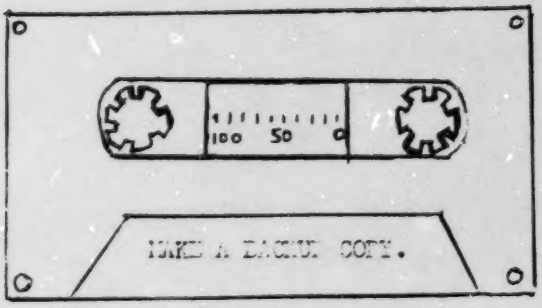

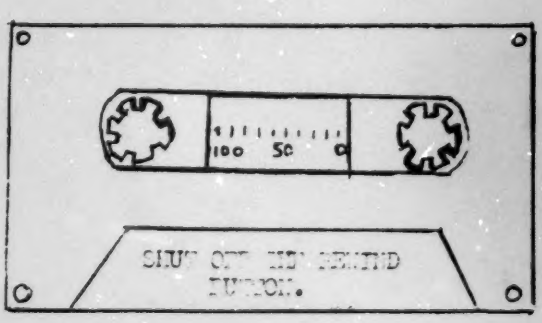

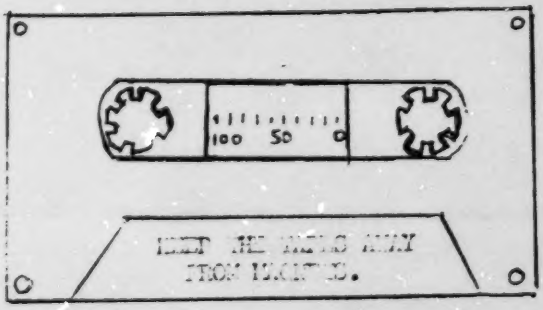

POUND RULES

1. Do not feed the PETS. They do not like drinks or food near them.

2. Be kind to the PETS. They do not like to be bent, folded, or otherwise mutilated.

3. Turn the hardware off when you are finished with it. (Remember what Mom said about the lights.)

4. If you borrow tapes, books, or other equipment please return it in the same condition it was in when you received it.

5. Rewind cassettes and put the dust covers back on the disks. Be careful how you handle these.

6. Clean up after yourself. (Your parents aren't here!)

7. NO GAME PLAYING without permission. Violators will be thrown out of the pound.

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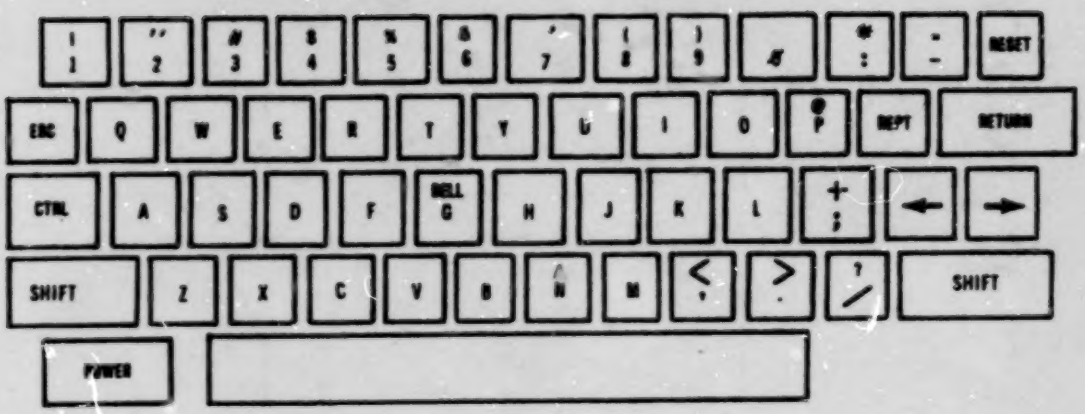
APPLE II KEYBOARD



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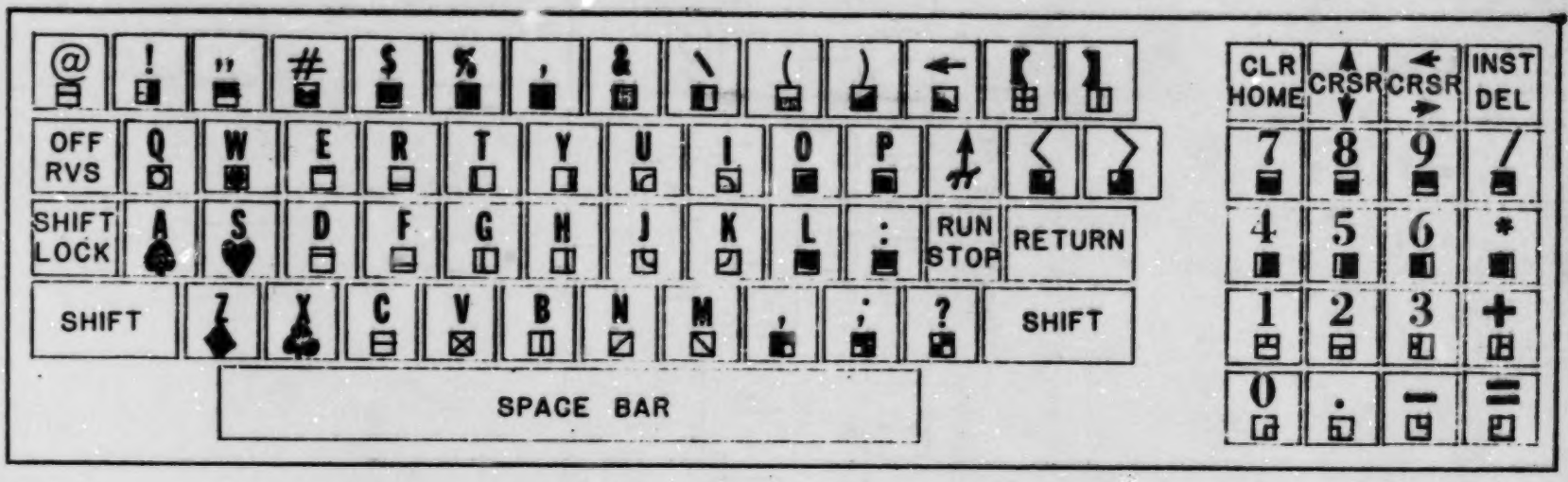
Level I
1-4-2

PET KEYBOARD



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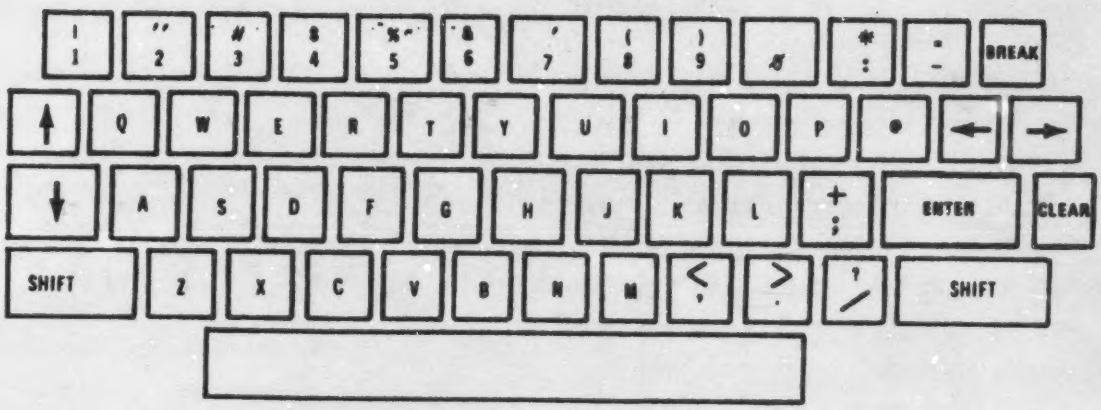
TRS—80 KEYBOARD



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COMMODORE PET

POWERING-UP THE BASIC

1) Turn on switch at left lower back.
2) Screen should say:
   ***COMMODORE PET BASIC 4.0 ***
   15359 BYTES FREE
   READY with blinking cursor (light square) below

LOADING A TAPE

1) Place tape in recorder and rewind to beginning.
2) Type LOAD
   press [RETURN] screen will say:
   PRESS PLAY ON TAPE #1
3) Press [PLAY] on recorder: screen will display:
   OK
   SEARCHING
4) When program is found the screen displays:
   FOUND (name of program)
   LOADING
5) When finished loading, the screen display will say:
   READY; and the blinking cursor will be back on the screen.
6) Please rewind tape and put it away.

COMMODORE PET

SAVING ON TAPE

1) Place tape in recorder and wind to desired spot on tape.
2) Type SAVE "(name of program)"
   press [RETURN.]
3) Screen will display:
   PRESS PLAY AND RECORD ON TAPE #1
4) When keys are pressed the display will say:
   WRITING (name of program)
5) When finished writing, the screen display will say: READY; and the blinking CURSOR will be back on the screen.
6) Rewind tape again; type VERIFY; and screen will display:
   PRESS PLAY ON TAPE #1.
7) WHEN [PLAY] is pressed the display will say: OK
   SEARCHING
   FOUND (name of program)
   VERIFYING
   OK
   READY

   Any error in saving will be announced.

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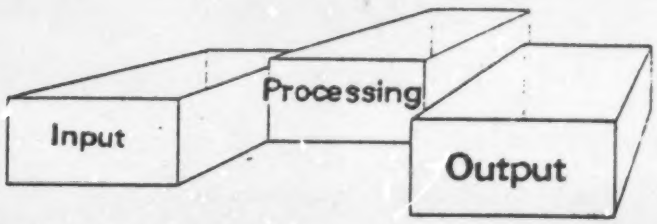

Level 1
11-1-1

MAKE A LIST OF EVERYDAY ACTIVITIES THAT DEMONSTRATE THESE PROCESSES.

ACTIVITY	INPUT	PROCESSING	OUTPUT
MAKING POPCORN	PUT KERNELS IN PAN WITH BUTTER AND TURN ON STOVE.	KERNALS BEGIN TO COOK AND POP.	POPCORN
WASHING DISHES	PUT DISHES IN DISH-WASHER.		

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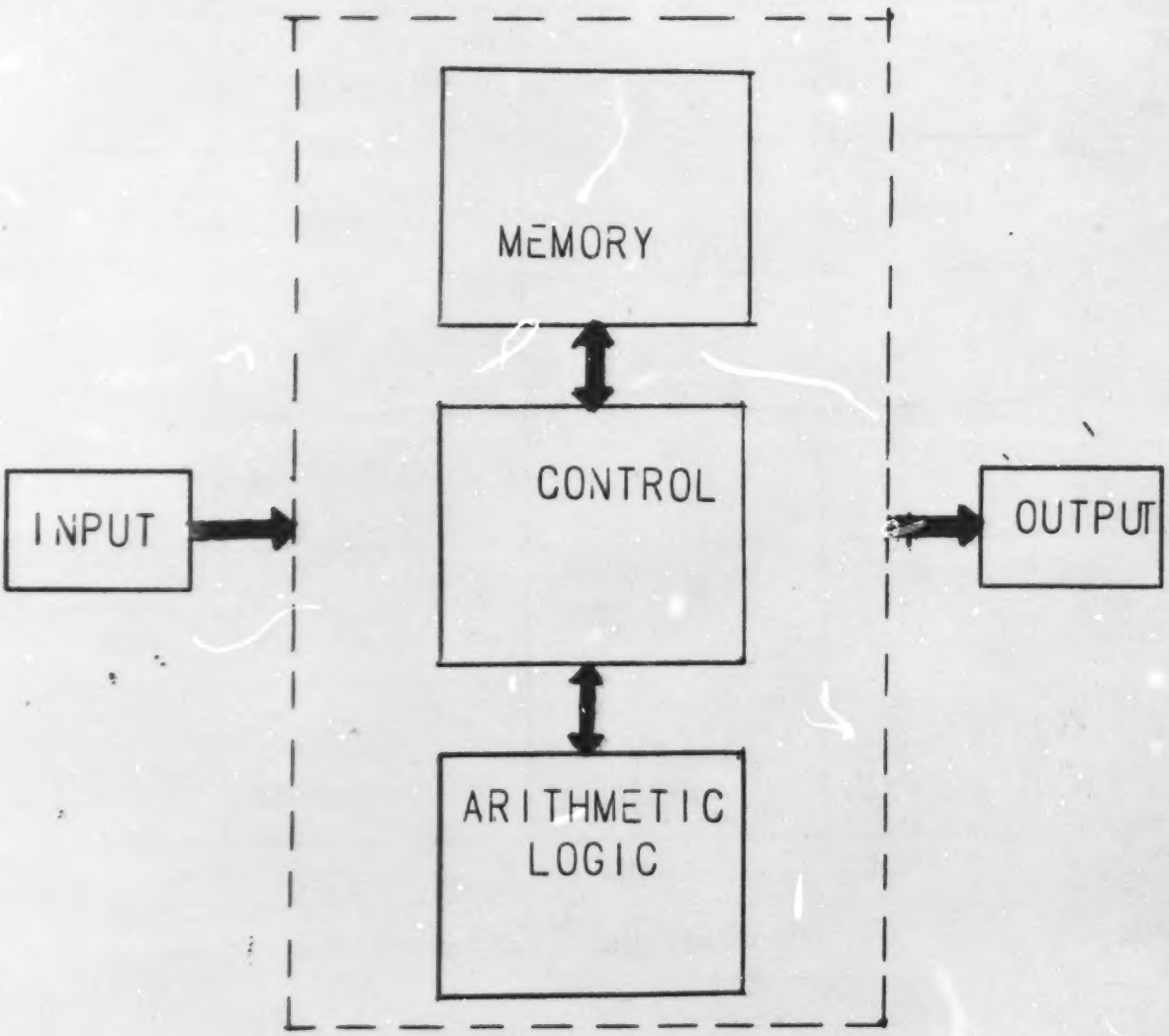
5 BASIC PARTS OF A COMPUTER

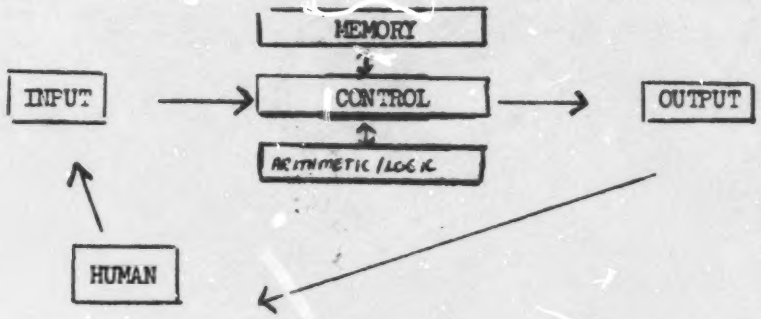


HUMAN SIMULATION - THE BASIC PARTS OF A COMPUTER

OBJECTIVE - to have the students play the parts of a computer.

EQUIPMENT NEEDED - 1) identification cards or badges to be worn by players.
2) input/output cards for problem and felt pens.

DIRECTIONS 1) Set the stage with the players wearing the cards as follows:



2) Have the students go through the following steps that a computer would have to perform to solve a simple problem.

STEP 1. HUMAN GIVES THE PROBLEM TO INPUT.
2. INPUT GIVES THE PROBLEM TO CONTROL.
3. CONTROL SENDS THE PROBLEM TO MEMORY.
4. HUMAN GIVES THE COMMAND RUN TO INPUT.
5. INPUT GIVES THE COMMAND RUN TO CONTROL.
6. CONTROL FETCHES THE PROBLEM FROM MEMORY AND SENDS IT TO ARITHMETIC/LOGIC.
7. ARITHMETIC/LOGIC SOLVES THE PROBLEM AND GIVES THE ANSWER TO CONTROL.
8. CONTROL SENDS THE ANSWER TO OUTPUT.
9. OUTPUT GIVES THE ANSWER TO HUMAN.

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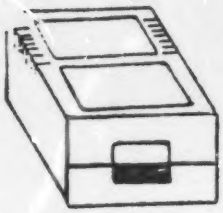
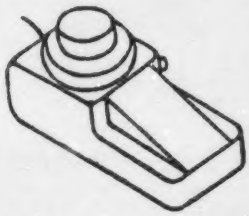
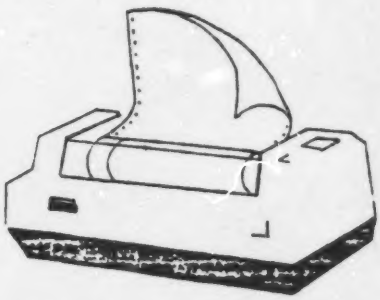
HARDWARE AND SOFTWARE

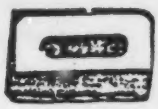
Level I
II-4-1

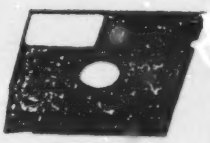
DIRECTIONS: Label the following items of computer hardware and software

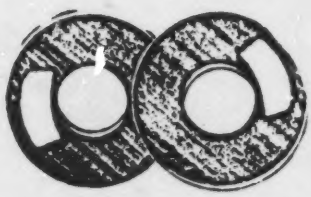


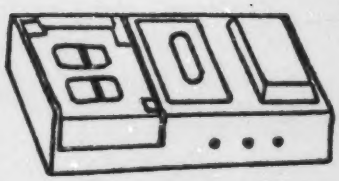


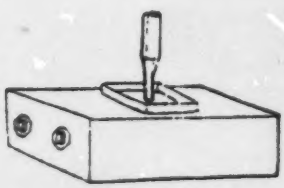


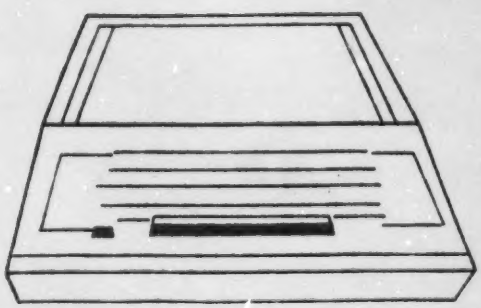












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SCRAMBLE

UNSCRAMBLED	SCRAMBLED
1. CARD PUNCH	1. HPUACC RDN
2. MEMORY	2. MRYMOE
3. INPUT	3. UPTIN
4. OUTPUT	4. TTUUPO
5. ARITHMETIC	5. MRHATCIITE
6. LOGIC	6. IGCOL
7. CPU	7. P[illegible]
8. CARD READER	8. RERDAACRED
9. DISK	9. IKDS
10. CASSETTE	10. CAESTSET
11. MAGNETIC	11. AGMCTNIE
12. PAPER TAPE	12. PPTPE AEAR
13. CRT	13. TCR
14. PRINTER	14. EINRTRP
15. LIGHT PEN	15. LHP ETNIG
16. MICR	16. CMRI
17. PLOTTER	17. POTRETL
18. MICROFILM	18. MCFIMIRLO
19. FLOWCHART	19. WL[illegible]AFRTHO
20. COMPU ER	20. OMRE[illegible]CUP

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MEDIA NOTEBOOK

(Hardware)

Put into a notebook 15 of the items listed below:

*Punch card

*Paper tape

*Magnetic tape

*Ad for a micro computer

*Ad for a mini computer

*Ad for a calculator that uses a computer

*Newspaper or magazine articles about computers (as many as you find with main points underlined)

*Cartoons about computers (as many as you find)

*Computer printed photo

*Ad for a toy that has a computer

*List of the uses of a computer

*Diagram of the parts of a computer

*List of the computer inventors and their inventions

*Printout of your initials done on a computer

*Computer glossary from A-Z

*List of input/output devices

*Poem about computers

*Microchip

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COMPUTER LANGUAGE COMPARISONS

The following three programs produce a table of squares from 1 to 10.
Note the similarities and differences.

BASIC

```
10 REM LOOP TO CALCULATE TABLE OF SQUARES
20 FOR T = 1 TO 10
30 LET S = T * T
40 PRINT T, S
50 NEXT T
60 END
```

FORTRAN

```
C  LOOP TO CALCULATE TABLE OF SQUARES
   REAL S

   DO 10 T=1, 10
   S = T * T
10 PRINT, T, S
   STOP
   END
```

Pascal

```
PROGRAM SQUARES
(* LOOP TO CALCULATE TABLE OF SQUARES
VAR S: REAL
BEGIN

   FOR T:= 1 TO 10 DO
      BEGIN
         S:= T * T;
         WRITELN(T,S)
      END:
END
```

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The programs below show how the area of a rectangle may be calculated
using BASIC, Pascal and Fortran.

BASIC

```
10 REM CALCULATE AREA OF A RECTANGLE
20 REM L=LENGTH W=WIDTH A=AREA
30 REM AREA=LENGTH * WIDTH    A=L*W
40 LET L = 10
50 LET W = 5
60 LET A = L * W
70 PRINT A
80 END
```

FORTRAN

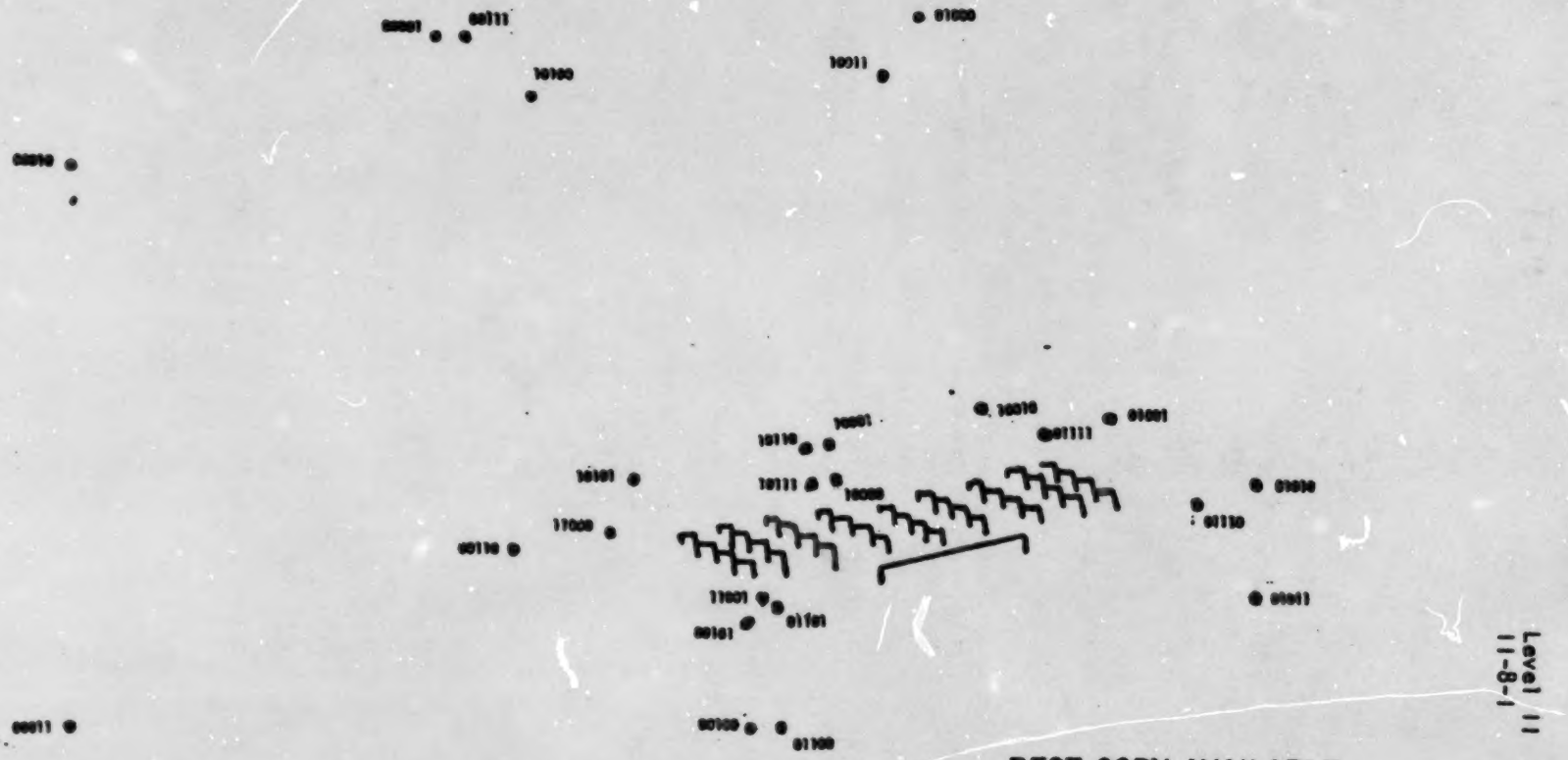
```
C    CALCULATE AREA OF A RECTANGLE
     REAL L, W, A
     L=10.
     W=5.
     A=L*W
     PRINT, A
     STOP
     END
```

Pascal (Batch)

```
PROGRAM AREA
(* CALCULATE AREA OF A RECTANGLE *)
VAR L, W, A: REAL;
BEGIN
   L:=10;
   W:=5;
   A:= L*W;
   WRITELN(A)
END
```

CONNECT THE BINARY DOTS

Connect the binary dots in sequence using a straight edge. Begin at 00001 and end at 11001 to complete the picture.



Level 11
11-8-1

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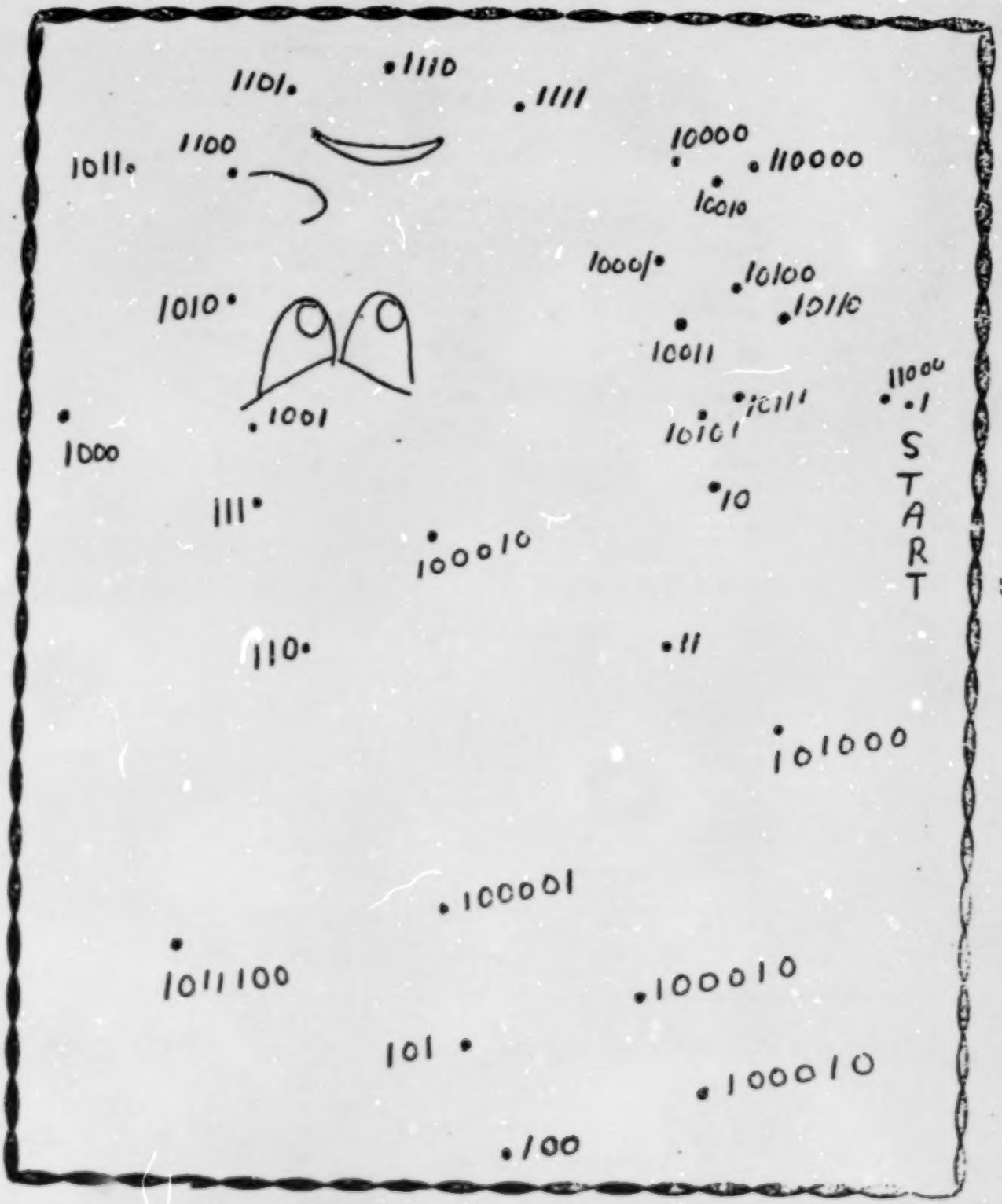
DOT TO DOT - BASE 2



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BINARY CODED DECIMAL

Using the six bit BCD code permits a maximum of sixty-four different six bit strings. Each of these unique strings is used to represent one of the sixty-four alphanumeric characters below:

Alphanumeric Character	Computer Code	Alphanumeric Character	Computer Code
0	000000	↑	100000
1	000001	J	100001
2	000010	K	100010
3	000011	L	100011
4	000100	M	100100
5	000101	N	100101
6	000110	O	100110
7	000111	P	100111
8	001000	Q	101000
9	001001	R	101001
[	001010	-	101010
#	001011	$	101011
@	001100	*	101100
:	001101	)	101101
>	001110	;	101110
?	001111	'	101111
(space)	010000	+	110000
A	010001	/	110001
B	010010	S	110010
C	010011	T	110011
D	010100	U	110100
E	010101	V	110101
F	010110	W	110110
G	010111	X	110111
H	011000	Y	111000
I	011001	Z	111001
&	011010	←	111010
.	011011	,	111011
]	011100	%	111100
(	011101	=	111101
<	011110	"	111110
\	011111	!	111111

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Assignment

1. Represent your first and last name using the six bit BCD code chart shown above. Print the corresponding character above each six bit BCD code. When you have finished this task, exchange your coding with someone else in class and check each other's conversion for accuracy.

2. Interpret the captions for the following cartoons, using the BCD code given previously. Write the decoded caption in the space provided at the bottom of each page.

Cartoon #1

010111	011001	110101	010101	010000
011001	110011	010000	010001	010000
010111	100110	100110	010100	111011
110010	110110	011001	010110	110011
010000	100010	011001	010011	100010

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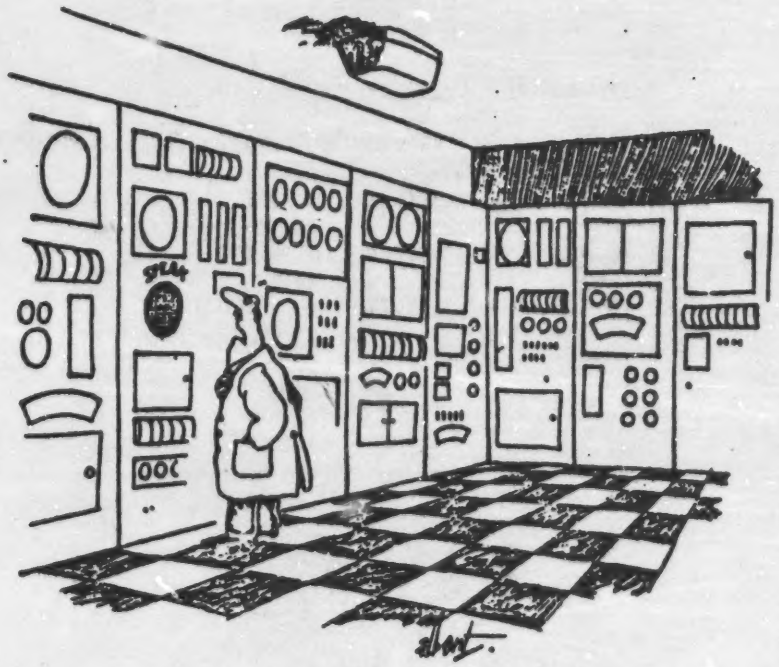
Cartoon #2



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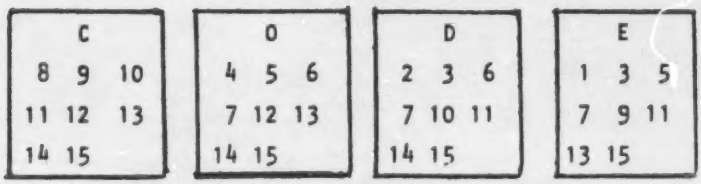
111110	010001	100101	010100	010000
011001	010110	010000	111000	100110
110100	010000	010111	010101	110011
010000	110010	110011	110100	010011
100010	111011	010000	010111	011001
110101	010101	010000	100100	010101
010000	010001	010000	110010	011000
100110	110100	110011	011011	111110

BINARY
MIND READING

Make up four cards which look like this.



Have someone think of a number between 1 and 15 and call off the cards the number is on. Try to figure out the code.
(HINT: Try calling off several more numbers and writing the results on the board.)

EXTENSION:
1. Make up cards to extend the game to numbers between 0 and 50.
2. Go to the library and find information on a very old mathematical game called NIM.
3. See your teacher for a computer program to do on this topic.

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COMPUTER HISTORY WORD SEARCH

At least nineteen different words which are associated with computer history are hidden in the puzzle below. The words that are listed at the bottom of this page are printed horizontally, vertically, diagonally and even backwards in the puzzle. Can you find them all?

K K T G B L E I B N I Z Q W K
M S T Z O A X O U C G X B R G
R I V A N C B V T Y W O I P Q
D O C F E H L B J I O J M T S
N R A R S I U Y A L T S B Q T
O Y A B O P T B E G W D D E O
I U L U A C T R H B E L A C N
T M E H Q C O I E H O I D A E
A I P R C C U M P K K U C L H
R T R J O U A S P E C I U E E
E O K V O C A J N U U E H V N
N R E H R D Z M N H T F K O G
E R O T S I S N A R T E Y L E
G K P A S C A L L K I X R L K
H O L L E R I T H N U F G B L

ABACUS	AIKEN	BABBAGE	BONES	BOOLE
CHIP	CORE	ECKERT	GENERATION	HOLLERITH
IC	JACQUARD	LEIBNIZ	LOVELACE	MAUCHLY
MICROCOMPUTER	NAPIER	PASCAL	SILICON	STONEHENGE
TRANSISTOR	TUBE	WATSON		

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This program is available for Commodore micros from:

Source: Cursor #14, October 79
Box 550
Goleta, CA 93017

ANSWER TO HISTORY OF COMPUTERS

```
   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
A  - E - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
B  - J N M I - S E - - - - - - - - R - - - - - - - - - - - - - - - -
C  - - A I - K A N - - - - - - - E - - - Z - - - - - - - - - - - - -
D  - - - C G - R I A - S - - I - - - I - - - - - - - - - - - - - -
E  - - - R Q N - A K M T T P - - - N - - - - - - - - M - S -
F  - - - O - U E C M E O A I - - B - - - - A - - - O R - S
G  - - - C - N A E - - N R - U I - - - - - B - - - O - M -
H  - - - O - I Y R C - E - S E C - - - - - A - - T L H - -
I  - - - M L V L - D N H S L - - R - - - - C - S - T - - - -
J  - - - P - A H O L L E R I T H - I - - - U I - I - - - - -
K  - - - U - C C - - B N R D - - - - C - - S - R - - - - - -
L  - L E T N I U S U - G - E - - - - - - D N B A B B A G E -
M  E C K E R T A T A - E - R F - - - - A E G - - - - - - - -
N  - - - R - - M - - P - - U - F - - R - O T - - - - - - ✓ -
O  - - - - - - U E N I G N E L A C I T Y L A N A - - - - - - -
P  - - - - - U - - - - - - - E - - - D - - - - - R - - - - - -
Q  - - - C - - - - - - - - - - - - - - - - - - - - G - - - -
R  - - A - - - - - - - - - - - - - - - - - - - - - - E - - -
S  - V - - - - - - - - - - - - - - - - - - - - - - - - T - -
T  - - - - - - - - - - - - - - - - - - - - - - - - - - - - N -
U  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - I
```

START	DIR	WORDS
F-21	D	ABACUS
C- 7	D-R	AIKEN
O-22	L	ANALYTICALENGINE
L-21	R	BABBAGE
P-17	U-L	DIFFERENCEENGINE
M- 1	R	ECKERT
S- 8	D	ENIAC
J- 7	R	HOLLERITH
U-28	U-L	INTEGRATEDCIRCUITS
L- 6	L	INTEL
B- 2	D-R	JACQUARD
I-13	U-R	LEIBNIZ
O-19	U-R	LOGARITHMS

START	DIR	WORDS
H-25	U	LOOM
F- 9	U-L	MARK I
N- 7	U	MAUCHLY
B- 4	D	MICROCOMPUTER
G-11	U-R	NAPIER
N-10	U-L	PASCAL
G-12	U-L	ROMANS
H-13	D	SLIDERULE
D-11	D	STONEHENGE
O-17	U-R	TRANSISTORS
F- 6	D	UNIVAC I
S- 2	U-R	VACUUMTUBES

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#1:0 25 HISTORY OF COMPUTERS

72

LOOM
MARKI
MAUCHLY
MICROCOMPUTER
NAPIER
PASCAL
ROMANS
SLIDERULE
STONEHENGE
TRANSISTORS
UNIVACI
VACUUMTUBES

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COMPUTER SPEED

Ask the class to write down on scrap paper the numbers 1, 2, 3, 4 . . . as fast as they can during a 15 second time interval. After this exercise, record the highest number written by members of the class. The following BASIC program will cause a microcomputer to print the numbers 1, 2, 3, 4 . . . on the television screen:

```
10 FØR I=1 TØ 10000
20 PRINT I
30 NEXT I
```

NOTE: Ø is the letter "oh" where as 0 is the numeral zero.

After this program is entered, type in RUN and begin the 15 second time interval just as you depress the ENTER or RETURN key. When the time is up, depress the BREAK or STOP key to halt the printing on the screen. What was the last value printed? Record this number and compare it with your students' results. How many times faster is the computer than a human?

The next step is to suggest to the class that they could probably count faster and higher if they did not have to write down the individual numbers. This time ask the class to count 1, 2, 3, 4 . . . silently to themselves as fast as they can during a 15 second interval. Again record the highest value reached after 15 seconds. Modify the previous microcomputer program by deleting line 20. This can be accomplished quickly by typing 20 and then pressing the ENTER or RETURN key. If LIST is typed in, the program should appear as follows:

```
10 FØR I = 1 TØ 10000
30 NEXT I
```

You should explain to the class that since the computer has not been told to PRINT the numbers on the screen, it will simple count quietly to itself and the screen will remain unchanged. Type in RUN and press the ENTER or RETURN key at the start of the 15 second interval. After 15 seconds depress the BREAK or STOP key. To determine what value the computer was "saying to itself" when it was interrupted, you must ask it to display the current value in memory location I. Type in PRINT I (with no line number preceding the command) and the computer will display the value reached. Record the results. How much faster is the computer compared with your class? How much faster is the computer at counting to itself compared to printing out the values on the screen?

COMPUTER SPEED vs. HUMAN SPEED

Teacher Directions:

Once the following program (lines 5 to 700) is entered on your microcomputer and is running free of errors, an interesting comparison can be made between the time it takes a person and a computer to arrange thirty names in alphabetical order.

```
5 REM * COMPUTER AWARENESS DEMO
6 REM * TO ILLUSTRATE COMPUTER SPEED
10 DIM A$(30),A(30)
20 FOR K=1 TO 30
30 READ A$(K)
35 A(K)=K
40 NEXT K
50 PRINT"□"
60 PRINT"   HOW LONG WILL IT TAKE YOU TO LIST"
70 PRINT"THE FOLLOWING THIRTY NAMES IN"
80 PRINT"ALPHABETICAL ORDER?"
85 PRINT
90 FOR K=1 TO 28 STEP 3
100 PRINTTAB(1);A$(K)TAB(15);A$(K+1)TAB(27);A$(K+2)
110 NEXT K
130 PRINT
132 PRINT"   ONCE YOU HAVE COMPLETED THIS SORTING"
134 PRINT"TASK AND HAVE RECORDED YOUR TIME IN"
136 PRINT"SECONDS, GET READY TO CHECK THE"
138 PRINT"COMPUTER'S SPEED AND ACCURACY.
140 PRINT
142 PRINT"   WHEN YOU ARE READY TO BEGIN TIMING"
144 PRINT"THE COMPUTER, PRESS 'C' TO CONTINUE AS"
146 PRINT"YOU BEGIN COUNTING THE SECONDS."
160 GET R$:IF R$ <> "C" THEN 160
170 PRINT"□"
190 PRINT"   ONE MOMENT PLEASE ..."
195 PRINT
200 PRINT"   I'M BUSY ALPHABETIZING."
210 FOR J=2 TO 30
220 T=A(J)
230 I=J-1
240 IF A$(T)>= A$(A(I)) THEN 280
250 A(I+1)=A(I)
260 I=I-1
270 GOTO 240
280 A(I+1)=T
290 NEXT J
320 PRINT
340 FOR K=1 TO 10
350 PRINTTAB(1);A$(A(K));TAB(15);A$(A(K+10));TAB(27);A$(A(K+20))
360 NEXT K
370 PRINT:PRINT
380 PRINT"   YOU SHOULD NOW COMPARE YOUR SORTED"
390 PRINT"LIST OF NAMES WITH THIS COMPUTER"
400 PRINT"DISPLAY TO SEE IF THERE ARE ANY NAMES"
410 PRINT"WHICH ARE IN THE WRONG ORDER."
420 PRINT
430 PRINT"                    THANK YOU."
500 DATA ISAAK,SCHREYER,JONASSON
510 DATA NIELSON,FITKOWSKY,AIKENHEAD
520 DATA HENDERSON,RICHARDS,FEATHERSTONE
530 DATA ISAACS,BANNATYNE,RICHARDSON
540 DATA SCHROEDER,NELSON,MCCULLOCH
550 DATA COLLENS,SAMBORSKI,ACKLAND
560 DATA ORETZKI,SAWCHUK,COLLINS
570 DATA RICHARD,JONES,POIRIER
580 DATA O'GRADY,JONASSEN,NIELSEN
590 DATA REIMER,ISAAC,LAMOUREUX
700 END
```

PROGRAMMING NOTE:

This program is written for a Commodore micro. Lines 50 & 170 clear the screen. You may need to modify them if you are not using a PET. For example:
50 HOME (for APPLE) or
50 CLS (for TRS-80).
50 GR.8 (for ATARI)

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COMPUTER SPEED vs. HUMAN SPEED

Student Directions:

In this activity you are to compare the time that it takes both you and a computer to arrange the following names in alphabetical order. Please enter the exact time you start (hours, minutes, and seconds) in the space provided and once you have successfully completed the alphabetical sorting task, place the exact time that you finish in the corresponding space.

Start Time: (H:M:S) = ---:---:--- Finish Time: (H:M:S) = ---:---:---

Once the start time has been entered, look over the list of the names which appear below. Begin arranging the names in alphabetical order from A to Z (as they would appear in a telephone directory). Please enter the names in the correct order in the space provided below. If you feel that you might make errors, you may wish to use a pencil.

UNSORTED LIST

ISSAK	SCHREYER	JONASSON
NIELSON	FITKOWSKY	AIKENHEAD
HENDERSON	RICHARDS	FEATHERSTONE
ISAACS	BANNATYNE	RICHARDSON
SCHROEDER	NELSON	MCCULLOCH
COLLENS	SAMBORSKI	ACKLAND
ORETZKI	SAWCHUK	COLLINS
RICHARD	JONES	POIRIER
O'GRADY	JONASSEN	NIELSEN
REIMER	ISAAC	LAMOUREUX

SORTED LIST

1. ----------	11. ----------	21. ----------
2. ----------	12. ----------	22. ----------
3. ----------	13. ----------	23. ----------
4. ----------	14. ----------	24. ----------
5. ----------	15. ----------	25. ----------
6. ----------	16. ----------	26. ----------
7. ----------	17. ----------	27. ----------
8. ----------	18. ----------	28. ----------
9. ----------	19. ----------	29. ----------
10. ----------	20. ----------	30. ----------

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When you have finished writing down all thirty names in alphabetical order in the above spaces, enter your finish time in the space and figure out how many seconds it took you to complete this sorting task.

Now run the sorting program on the computer and determine how many seconds it takes your computer to sort the same list of names. Record below both your time and the computer's time (in seconds) to complete the identical job.

My time (in seconds) = -------- Computer time (in seconds) = --------

Check your sorted list against the computer list to see if any errors were made in the sorting process. Did you make any errors?

Now divide your time in seconds by the computer's time and place the answer below. This value roughly indicates how many times faster the computer is at sorting these names than you. It may be somewhat more accurate too! Compare your results with other students.

(My time)/(Computer time) = ---------

Computer Comparisons

Computer	List Price	~~System~~ Disc Drive	Microprocessor	RAM MIN MAX	Display	Graphics	Lower case letters	Sound	Other Languages
Apple IIe	$1800.00	$2495.00 - Computer monitor disc drive 80 column board	6502	64K	80 characters x 24 lines	290 x 192	yes	1 sound	FORTH LOGO PILOT PASCAL FORTRAN COBOL
Atari 400	$399.95 +$125 for recorder	$750	6502	16K 32K	40 characters x 24 lines	320 x 192	yes	4 sounds	PILOT MICROSOFT
Atari 800	$895.00 (48K)	$750	6502	16K 48K	40 characters x 24 lines	320 x 192	yes	4 sounds	PILOT MICROSOFT
Commodore VIC-20	$399.00 - includes recorder	$695	6502A	16K 32K	22 characters x 23 lines	176 x 176	yes	4 sound	FORTH LOGO
Commodore PET	4032 - $1460 8032 - $2063	$795 - single 1500 - double	6502	32K 32K - 96K	40 x 25 80 x 25	40 x 25 80 x 25	yes	none	Level III III-3-3
	Superpet -		6502 + 6809	96K					APL, PASCAL, COBOL, FORTRAN, ASSEMBLER
Commodore 64	$895.00	$695	6510	64K 76	40 characters x 25 lines	320 x 200 pixels unit. sprites	yes	3 voices + digitized sound	LOGO, PILOT PASCAL, CPM - Soon

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Computer	List price	Disc Drive	Microprocessor	RAM min max	Display	Graphics	Lower case letters	Sound	Other Languages
TI 99	$399.00		9900	16K 48K	32 Characters x 24 lines	256 x 192		yes	PASCAL LOGO
Timex-Sinclair	$149.95		Z80A	2K 16K	32 Characters ^	44 x 64	no	no	
TRS-80 MODEL III	$999.00	$2999.00 - 48K Computer 2 discs and printer	Z80A	4K 48K	64 Characters ^	128 x 48	yes - at extra cost	no	COBOL FORTRAN PASCAL PILOT
TRS-80 COLOR COMPUTER	$449.00 - 16K $599.00 - 16K extended BASIC $799.00 - 32K	$699.00	6809E	16K 32K	32 Characters x 16 lines	256 x 192 with extended BASIC	no	1 sound	LOGO
									Level III III-3-3
132				77				133	

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PERPLEXING PARENTHESES

The answers to the following equations are incorrect. Do you know why? _____

_____

Rewrite each equation, placing parentheses in the appropriate places to make the equations true. EXAMPLE 5*7+2=45 5* (7+2)=45

1) 5*3+7=50 _____
2) 20/2+2=5 _____
3) 7-4↑2=9 _____
4) 17-5+3/2=13 _____
5) 30/16-6+2=5 _____
6) 4+8/2=6 _____
7) 15/3+2=3 _____
8) 40-30↑5+3=10 003 _____
9) 60+20/5+3+2=12 _____
10) 12+3-2↑2-5+3=5 _____

"Guess My Number"

Enter the following program.

```
10 REM GUESS MY NUMBER
20 LET C=0
30 LET N=INT (RND(1)*100)+1
40 PRINT "I'M THINKING OF A NUMBER"
50 PRINT "FROM 1 TO 100.  CAN YOU"
60 PRINT "GUESS IT?"
70 PRINT
80 INPUT "WHAT IS YOUR GUESS"; G
90 LET C = C+1
100 IF G=N THEN 140
110 IF G<N THEN PRINT "LOW-TRY AGAIN"
120 IF G>N THEN PRINT "HIGH-TRY AGAIN"
130 GO TO 70
140 PRINT
150 PRINT "CONGRATULATIONS . . . YOU"
160 PRINT "GOT IT IN "; C; " GUESSES"
170 END
```

Once your program is running try to modify or improve it in the following ways:

1. Change the program so that the values generated are from 1 to 1000.

2. Ask the user for his/her name and use their name in a response.

3. Ask the user if he/she wants to try to guess another number.

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KNOCK KNOCK JOKES

Using the following program as an example, write a program with a different "KNOCK, KNOCK" joke.

```
100 Clear the screen
110 REM KNOCK KNOCK JOKE
120 PRINT "KNOCK KNOCK"
130 INPUT K$
140 IF K$<>"WHO'S THERE" THEN 120
150 PRINT "CARGO"
160 INPUT C$
170 IF C$<>"CARGO WHO" THEN 150
180 PRINT "CARGO BEEP BEEP"
190 END
```

Line 100 is machine dependent. Use

```
100 PRINT "■" for Commodore Pets
100 CLS       for TRS-80's
100 HOME      for Apples
```

80

"BUG HUNT"

Type in the following program and debug. Record your revised program on the right hand side.

ORIGINAL

```
10 Clear the screen
20 PRINT "DIRECTIONS:"
30 PRINT
40 PRINT YOU HAVE 3 TRIES
50 PRINJ
45 PRINT "TO GUESS THE PASSWORD"
70 PRINT
80 PRINT "ENTER YOUR GUESS
   AFTER THE QUESTION MARK"
90 LET P$=MICROCHIPS
100 FOR T = 1 TO 3
110 INPUT G$
120 IF G = P$ THEN 170
130 PRINT TRY AGAIN"
140 NEXT Z
150 PRINT "GET LOST TRAITOR!"
160 GOTO 190
170 PRINT "ENTER MY FRIEND
180 END
```

DEBUGGED

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Once your program is running free of errors, change line 90 to your own password and see if a friend can run the program successfully and enter the correct password without listing your program.

"RIDDLE RUN"

Using the program guide below write a program which asks a riddle.

Note there are 3 possible inputs for the riddle:

1) a correct answer;
2) "I don't know";
3) an incorrect answer.

PROGRAM GUIDE

Clear the screen _____

Give directions _____

_____

_____

Use an Input to "press C to continue _____

Ask the riddle _____

Input the answer -

1) Correct answer - GOTO "That's Right" _____
2) I don't know - GOTO the answer _____
3) Incorrect answer - "Try Again" _____

Go back to joke _____

Answer "That's Right" _____

Go to the end _____

Give answer

_____

Print a funny laugh _____

Print "The End" with a timer. _____

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GAME PROJECT

Find a simulation or game that interests you and type the list of it into the computer. (Bonus marks for an original!)

The final product should run with no bugs and should contain as many of the following features as possible:

1. REM statements with the source, the variables and what they represent, and your name.

2. The title blinking on and off.

3. Directions edited appropriately.
   (i.e. spaces every other line, no split words, etc.)

4. An option to see the directions.

5. An original graphic.

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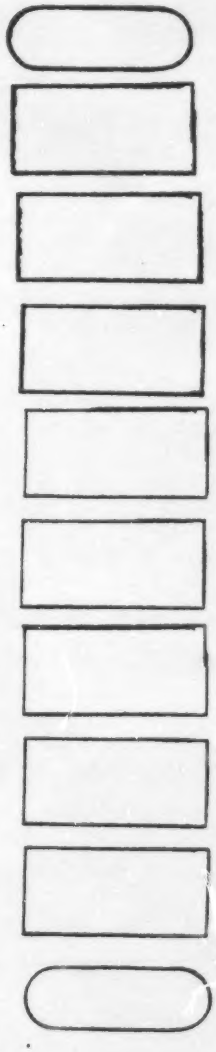
Fascinating Flowcharting

Complete the following flowchart by filling the blank shapes with the appropriate step number.



MISSING STEPS

1. put scoop of ice cream in dish
2. get out ingredients
3. spray whip cream on sauce
4. put a cherry on top
5. stop
6. get out a dish and a spoon
7. start
8. pour chocolate sauce on icecream
9. enjoy sundae
10. scoop out ice cream

ACTIVITY

DESIGN A FLOW CHART FOR MAKING A PIZZA.

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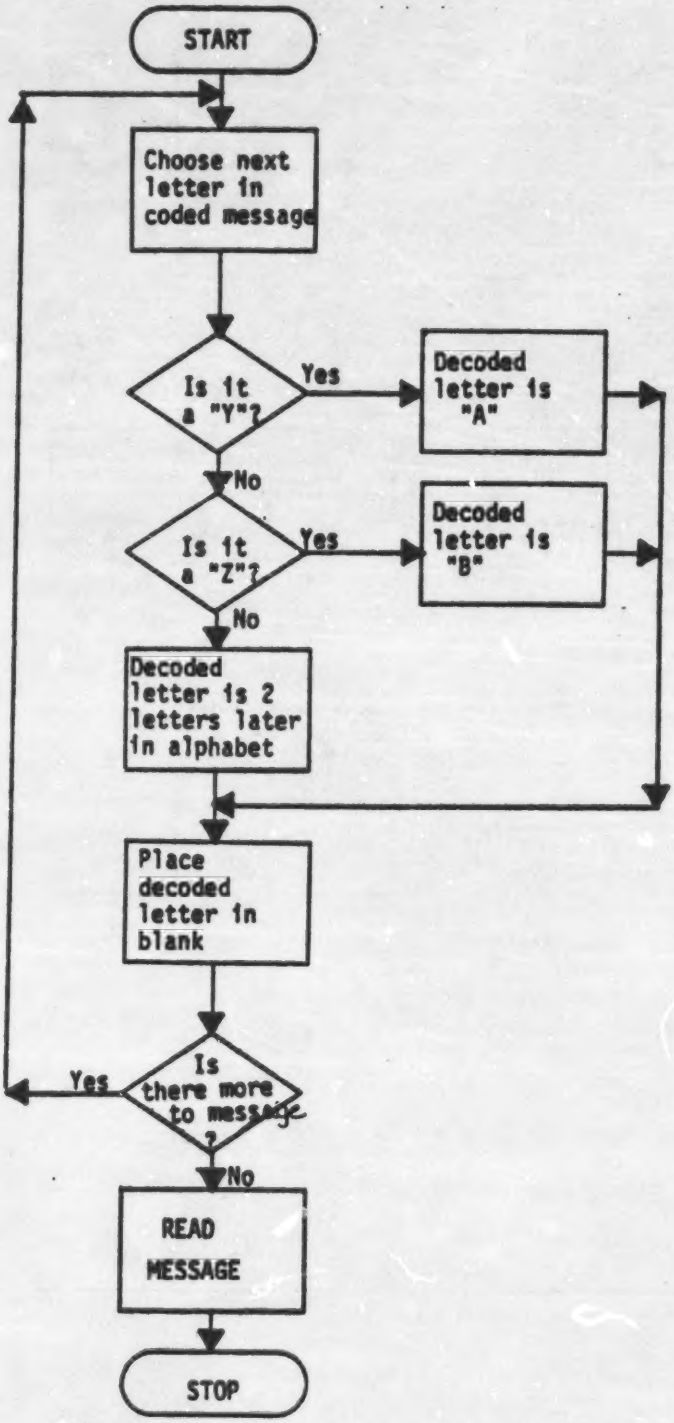
DECODING SECRET MESSAGES USING FLOWCHARTS

Level III
IV-5-2

Use the flowchart below to decode the secret message.



Coded: A M K N S R C P Q L C T C P K Y I C K G Q R C Y I Q

Decoded: _____ _____ _____ _____

STUDENT Name: _____

THE MECHANICAL MAN

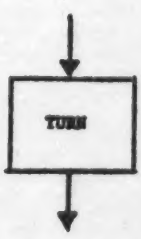
Draw a flowchart of the procedure necessary to command a mechanical man, who is sitting in a chair facing a wall a short distance away, to walk to the wall and return to his original position. The following flowchart symbols are allowed:

Begin the procedure.

Raise arms straight out.

Lower arms.

Halt the procedure.



Turn 90° to the right.

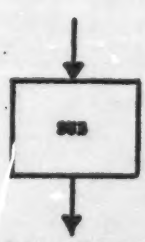
Stand up.

Sit down.

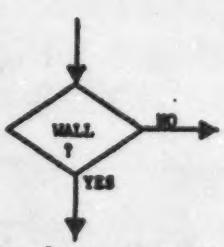
Take one step.

Set the counter to zero.

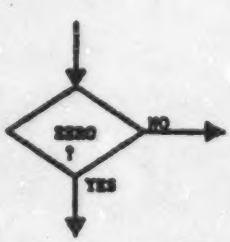
Add 1 to the counter.



Subtract 1 from the counter.



Test for touching wall. Arms must be straight forward to activate the finger-contact units.



Test if counter is zero.

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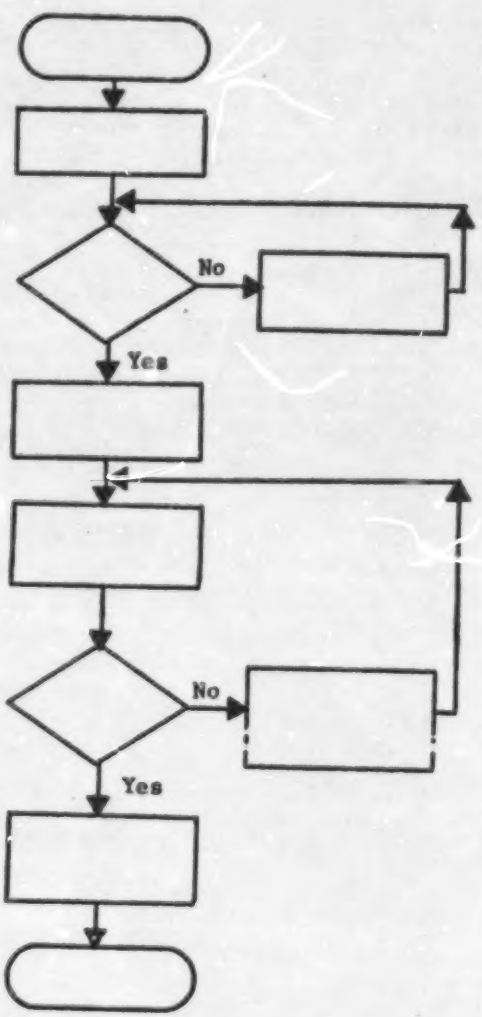
The flowchart below is supposed to show the steps which are involved in watching television. Put the following steps in the proper symbols on the flowchart by placing the step number in the proper symbol. Please note that the steps listed are not in the propper sequence.

1. Select the T.V. channel
2. Is the "pop" cold?
3. Adjust T.V.
4. Return "pop" to refrigerator
5. Turn on T.V.
6. Is T.V. working properly?
7. Start
8. Enjoy T.V. program
9. Halt or Stop
10. Get "pop" during T.V. commercial



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MEDIA NOTEBOOK
(Society)

Put into a notebook 15 of the items listed below:

*Computer printed grocery tape

*Sample of the UPC

*Ad for a micro computer

*Ad for a mini computer

*Ad for a calculator that uses a computer

*Newspaper or magazine articles about computers (as many as you find with main points underlined)

*Cartoons about computers (as many as you find)

*Computer generated career

*Computer-related job advertisement

*Ad for a toy that has a computer

*List of the uses of a computer

*List of future uses of a computer

*Cancelled bank cheque

*Printout of your initials done on a computer

*Computer glossary from A-Z

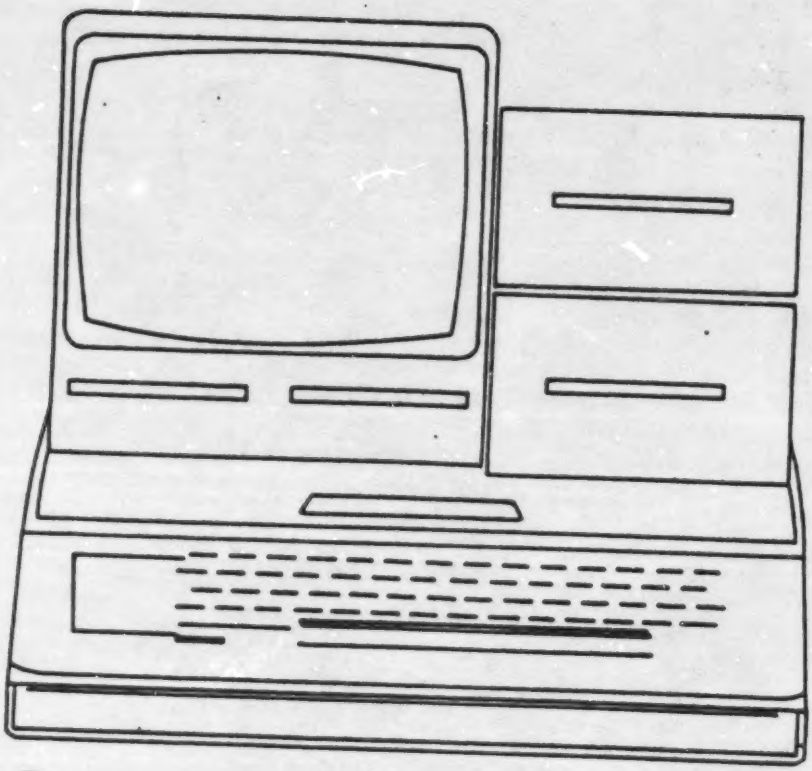
*Computer generated letter ("junkmail")

*Computer generated airline ticket

*Story about computers

*Computer-generated utility bill

Computers Can...



Computers Cannot...

Humans can ...

Humans cannot ...

COMPUTERS AND SOCIETY QUESTIONNAIRE

Please indicate your view with respect to the following statements about computers. After reading each of the following statements carefully, circle a

1 if you strongly agree (SA)
2 if you mostly agree (MA)
3 if you are neutral or have no opinion (NO)
4 if you mostly disagree (MD)
5 if you strongly disagree (SD)

Thank you.

****

Statement	S A	M A	N O	M D	S D
1. Computers will improve health care.	1	2	3	4	5
2. Computers will improve education.	1	2	3	4	5
3. Computers will improve law enforcement.	1	2	3	4	5
4. Computers slow down and complicate simple business operations.	1	2	3	4	5
5. Computers are best suited for doing repetitive, monotonous tasks.	1	2	3	4	5
6. Computers make mistakes at least 10 percent of the time.	1	2	3	4	5
7. Programmers and operators make mistakes, but computers are, for the most part, error free.	1	2	3	4	5
8. Computers dehumanize society by treating everyone as a number.	1	2	3	4	5
9. It is possible to design computer systems which protect the privacy of data.	1	2	3	4	5
10. Credit rating data stored on computers have prevented billions of dollars of fraud. This is a worthwhile use of computers.	1	2	3	4	5
11. In Canada today, a person cannot escape the influence of computers.	1	2	3	4	5
12. Computers will create as many jobs as they eliminate.	1	2	3	4	5
13. Computers will replace low skill jobs and create jobs needing specialized training.	1	2	3	4	5
14. Computers are a tool just like a hammer or lathe.	1	2	3	4	5
15. Computers are beyond the understanding of the typical person.	1	2	3	4	5
16. Computer polls and predictions influence the outcome of elections.	1	2	3	4	5
17. Computers isolate people by preventing normal social interactions among people who use them.	1	2	3	4	5

Source: Ahl, David H. The Best of Creative Computing. Vol. 1. Morristown, N.J.: Creative Computing Press, 1976, p. 209.